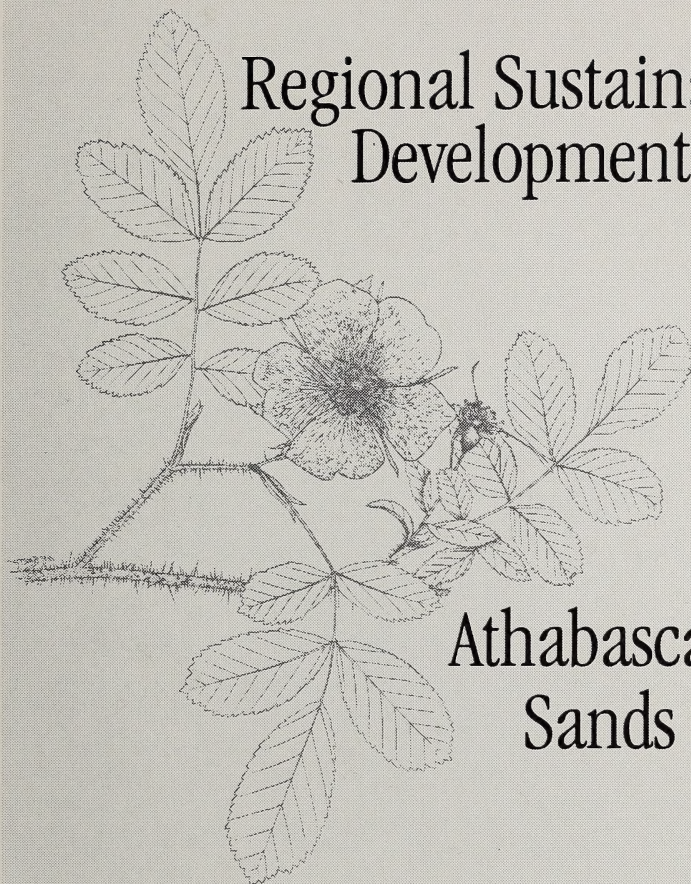


# Regional Sustainable Development Strategy

for the

Athabasca Oil  
Sands Area







# Table of Contents

Executive Summary .....	1
<b>Section 1. Overview .....</b>	<b>3</b>
Introduction .....	3
Principles .....	4
Focus of the RSDS .....	5
<b>RSDS Area Boundary Map .....</b>	<b>8</b>
<b>Section 2. The Regional Sustainable Development Strategy .....</b>	<b>9</b>
The RSDS Area .....	9
Roles and Responsibilities of Government Agencies in RSDS .....	9
Activity Approval .....	11
Regional Issues and Themes .....	11
Proposed Timelines, Activities and Resources .....	12
Building an Information Base for RSDS .....	14
<b>Section 3. The RSDS Management Model .....</b>	<b>15</b>
Setting Regional Goals .....	16
Setting Management Objectives .....	16
Choosing Management Options .....	18
Gathering and Using Information .....	20
Operating the System—Blueprints for Action .....	20
Evaluating the System—Assessing the Success of RSDS .....	20
Introducing New Issues .....	21
<b>Section 4. Blueprints for Action .....</b>	<b>23</b>
Theme 1.—Sustainable Ecosystems and Land-Use .....	23
Theme 2.—Cumulative Impacts on Wildlife .....	24
Theme 3.—Soil and Plant Species Diversity .....	25
Theme 4.—Effects of all Air Emissions on Human Health, Wildlife, and Vegetation .....	26
Theme 5.—Effects of Heavy Metals Deposition— Consumption and Bio-Accumulation .....	27
Theme 6.—Access Management .....	28
Theme 7.—Cumulative Impacts on Fish Habitat and Populations .....	29
Theme 8.—Effects of Emissions From Tailing Ponds .....	30
Theme 9.—Effects of Acid Deposition on Sensitive Receptors .....	31
Theme 10.—Cumulative Impacts on Surface Water Quality .....	32
Theme 11.—End Pit Lake Water Quality .....	33
Theme 12.—Cumulative Impacts on Surface Water Quantity .....	34
Theme 13.—Cumulative Impacts on Groundwater Quantity .....	35
Theme 14.—Cumulative Impacts on Groundwater Quality .....	36

July , 1999

Pub. No. I/754

ISBN: 0-7785-0680-0

<b>Appendix A. Deputy Minister Initiating Letter .....</b>	<b>37</b>
<b>Appendix B. Terms of Reference .....</b>	<b>39</b>
<b>Appendix C. RSDS Partners .....</b>	<b>45</b>
<b>Appendix D. List of Issues for the Regional Sustainable Development Strategy .....</b>	<b>51</b>
<b>Appendix E. Action Taken on Category A Issues Themes 1 to 5 .....</b>	<b>59</b>

*A glossary of acronyms used in this document can be found in the accompanying Technical Support Document, Appendix 1.*



# Executive Summary

Alberta's environmental and natural resource management systems are designed to make sure the environmental impact of development is minimized, and the air, land, surface water and drinkable groundwater all meet provincial guidelines. In addition, they are used to ensure disturbed areas are properly reclaimed, renewable resources are regenerated successfully, wildlife populations are sustained and wilderness is conserved.

Alberta's current systems are very effective and highly regarded—the standards set in Alberta meet or exceed most national and North American standards. The unprecedented pace of development in the Athabasca Oil Sands area, however, presents new challenges for the environmental and resource management systems of governments and industry. These include overlapping needs for access to public land; competition for renewable public resources such as forests, wildlife and water; and increased potential for effects on environmental quality, species diversity and abundance, and human health.

In September 1998, based on anticipation of further oil sands resource development in northern Alberta, Alberta Environment (AENV) committed to leading the creation of the Regional Sustainable Development Strategy (RSDS) for the Athabasca Oil Sands region. The development was led by the Northeast Boreal Region of AENV, with a strong partnership involving regional stakeholders and regulators. The partners include First Nations and Aboriginal Communities, industry, environmental interest groups and government agencies (provincial [Alberta and Saskatchewan], municipal and federal).

The RSDS builds on Alberta's current environmental and resource management system by creating the framework for the following:

- ❑ Providing support for the continued economic development in the region that addresses environmental needs and resource sustainability.
- ❑ Creating an enhanced management framework that will adapt to the changing needs of the area, which will guide government's environmental and resource managers.
- ❑ Developing a strong foundation of environmental information and science to assist in making decisions on sustainable resource and environmental management in the region.
- ❑ Creating a way to identify priority regional environmental issues, and to organize the science and monitoring work needed to understand these issues.

An inventory of environmental and resource management systems, the identification and analysis of issues, and the drafting of the RSDS were completed on July 30, 1999. The 72 issues addressed by the RSDS were identified from project-specific environmental impact assessments in the region, the *Athabasca Oil Sands Cumulative Effects Assessment Framework Report*<sup>1</sup>, and from issues raised during Alberta Energy and Utilities Board (EUB) hearings on oil sands mines and in situ bitumen production projects. The issues were grouped according to similarities in their information gaps, and a list of 14 themes was created. Blueprints for action were then developed to resolve the issues within these theme groups. The groups were separated into the following three categories:

**Category A (based on information gaps and urgency)**

Sustainable ecosystems; cumulative impacts on wildlife; soil and plant species diversity; effects of air emissions on human health, wildlife and vegetation; and bioaccumulation of heavy metals.

**Category B (based on information gaps and work underway)**

Access management; cumulative impacts on fish habitat and populations; effects of tailings pond emissions; effects of acid deposition on sensitive receptors; and impacts on surface water quality.

**Category C (based on information gaps, work underway, and lower level of urgency)**

End pit lake water quality; impacts on surface water quantity; and impacts on groundwater quantity and quality.

It is recognized and acknowledged that issues of tomorrow may be different from those of today. RSDS provides a framework and a process to review and adapt environmental and resource management in a continuous learning format, and to improve and respond quickly to changing circumstances.

<sup>1</sup> *Athabasca Oil Sands Cumulative Effects Assessment Framework Report* Prepared for the Cumulative Environmental Effects Management Initiative; February 1999. Golder Associates Ltd.



# 1

## Section Overview

### Vision of Sustainable Development for Alberta

Alberta, a member of the global community, is a leader in sustainable development, ensuring a healthy environment, a healthy economy, and a high quality of life in the present and future.

*Alberta's Commitment to  
Sustainable Resource and  
Environmental Management*

## Introduction

Oil sands development in Alberta has been intensifying over the past few years as reserves of conventional crude oil diminish. A large part of the development involves the Athabasca Oil Sands deposit in northeastern Alberta, which has made this region the focus of the Regional Sustainable Development Strategy.

The RSDS follows the direction laid out in the recent policy document, *Alberta's Commitment to Sustainable Resource and Environmental Management* (March 1999). This document confirms, "Resources such as trees, minerals, wildlife, water, fish, range, public land and plants shall be managed in a manner that addresses their interdependence, and recognizes that the use of one resource can affect other users and other resources. Environmental decisions will take into account economic impacts, and economic decisions will reflect environmental impacts."

The policy document supports the Alberta Advantage, which recognizes the need to balance opportunities for growth with the need to preserve and maintain the rich environment for future generations. It confirms Alberta's commitment to sustainable development, and describes the provincial government's approach to sustainable resource and environmental management. It also provides Alberta's vision for sustainable development, which is highlighted in the box on the left.

The RSDS provides a framework for balancing development with environmental protection. The careful resource management practices followed in Alberta are fundamental to this balance. This provincial direction for sustainable resource management was confirmed in the March 1999 policy document, and is as follows:

- ☐ The use of Alberta's natural resources shall be sustainable.
- ☐ The management of Alberta's natural resources shall support and promote the Alberta economy.
- ☐ Alberta's environment shall be protected.
- ☐ Resources shall be managed on an integrated basis.
- ☐ Alberta's natural resources shall be managed for multiple benefits.

Alberta Environment (AENV) is leading the process for developing this regional strategy, and is working in co-operation with all regional stakeholders, including federal and municipal governments. The RSDS is designed as a "living document" to keep pace with changes in the region. It is guided by government policy, and is consistent with provincial and national commitments to sustainable development and biological diversity. Extensive work has been underway for several years to gather environmental and resource information in



the region, and to manage the effects of development activity on people and the environment.

By working in partnership, the key issues and needs in the region have been identified by government agencies, regional stakeholders and regulators, and special interest groups. Examples of these needs are as follows:

- ☐ *Industry*—greater certainty about access to resources, and a role in shared environmental management of the resources in the region.
- ☐ *First Nations and Aboriginal Communities*—an essential voice in developing this strategy, which includes recognition of their existing rights and uses in the region.
- ☐ *Environmental organizations and concerned citizens*—a voice and role in the orderly development of the region, and a commitment from the provincial government to maintain an acceptable level of environmental quality.
- ☐ *Government agencies that deliver services and regulate activities in the region*—a common ground on which to base long-term goals for sustainable development and environmental management of the region.

## Principles

Sustainable development is a shared responsibility. It is based on integrating environmental protection with economic growth and resource use, and making full use of the available management tools and resources. Co-operation among all regional stakeholders, including government agencies, is a positive step toward achieving sustainable development.

Based on discussions among stakeholders and on the guidance of provincial, national and international views of sustainable development, the following principles have been identified for the RSDS region:

1. The environment will be protected.
  - High quality air, land and water will continue to be maintained.
  - Disturbed land will be returned to a state equivalent to the capability that existed before disturbance, with acceptable landform, soil, vegetation, habitat, wetlands and drainage.
  - A diversity and abundance of wild plants, animals and fish will be maintained.
2. Resources will be managed effectively.
  - Renewable resources will be managed to ensure their long-term viability and future use potential.
  - Non-renewable resources will be managed to maximize benefits to Albertans.
  - Renewable resources will be managed for traditional, recreational and resource development uses.

*"The environment is where we all live, and development is what we all do to improve our lot within that abode. The two are inseparable.... What is needed is a new era of economic growth — growth that is forceful and at the same time socially and environmentally sustainable."*  
(Our Common Future, by G.H. Brundtland, WCED, 1987)



- Resources will continue to be developed within the requirements of provincial legislation, policies and guidelines.
  - All resource development will occur in an orderly manner that considers and preserves environmental quality not only within Alberta, but also in neighbouring government jurisdictions.
3. Learning will continue.
    - Information gathering and research will provide greater knowledge about the overall environment in the region.
    - The management strategy will be modified based on the new information, needs or goals that are required to ensure sustainable development will be realized.
  4. Stewardship will be shared.
    - In all cases, resource users and other regional stakeholders will continue to share in strong environmental stewardship of the land and resources.
    - Regional stakeholders will contribute their time, expertise and knowledge, and take part in multi-stakeholder initiatives. In turn, this gives them a greater voice in resource and environmental management of the region.

## Focus of the RSDS

The focus of the RSDS is to address the need to balance resource development and environmental protection. It will meet these challenges in the following manner:

- ☐ Provide support for resource development at a rate consistent with environmental protection and resource sustainability by ensuring there is an effective framework for managing natural resources and the environment.
- ☐ Involve regional stakeholders in shared environmental stewardship.
- ☐ Create an environmental management framework that can adapt to the changing needs of the area to guide government environmental and resource managers.
  - Develop a strong foundation of environmental information and science to assist in making decisions on sustainable resource and environmental management.
  - Develop a method to identify priority regional environmental issues, and to organize the science and monitoring work that is needed to understand these issues.
- ☐ Communicate information on environmental initiatives and the RSDS to members of the public.
- ☐ Co-ordinate the joint stewardship approach to resource management.

Achieving this balance is especially challenging at the regional level, since there are various uses competing for the same resource or land base. To address this, goals and objectives are based on provincial and federal legislation, policies and guidelines to ensure resource development and use do not overshadow environmental protection.

To achieve a balance between environmental protection and resource development in the RSDS region, there are a number of factors to consider. Examples of these are:

- ☐ The eventual development of most of the surface mineable oil sands (i.e., phased, open-pit surface or in situ operations, which will affect a pre-determined amount of the land base)—This will be guided by the need to maximize the benefits for future generations, and the requirements to maintain the quality of the environment.
- ☐ Ongoing timber harvesting and mineral exploration—These activities will continue to be guided by sound environmental practices and stewardship of the land and resources.
- ☐ The preservation of animal and plant species—All Albertans are committed to the concept that no known species of plant or animal will be lost from Alberta. National and provincial biodiversity policies and guidelines will be followed to ensure species preservation.
- ☐ First Nations and Aboriginal communities requirements for a traditional lifestyle—Land, plants and animals will continue to be available to support a traditional lifestyle for current and future generations.









## Section 2.

# The Regional Sustainable Development Strategy

## The RSDS Area

The boundary of the RSDS coincides with that of the Regional Municipality of Wood Buffalo. Although the strategy applies only to the air, water and development activities within this region, impacts can extend beyond the boundary. Jurisdictions outside the boundary of the RSDS are also considered stakeholders if they are currently affected by resource development, or if there is potential for this to occur in the future. This includes the Province of Saskatchewan, owing to the potential for transboundary effects.

Strong linkages are maintained with neighbouring government jurisdictions, including the Northwest Territories and Saskatchewan. Links are also maintained to adjacent municipalities within Alberta and to Wood Buffalo National Park.

### Parks and Protected Areas

The RSDS area, which contains part of the Boreal Forest Natural Region and the Canadian Shield Natural Region, lies next to Wood Buffalo National Park, which is designated as a World Heritage Site. The national park contains two Ramsar sites—the Peace-Athabasca Delta and the Whooping Crane summer range. Within the RSDS region there are six candidate Special Places, 14 Recreation Areas, three Ecological Reserves, one Natural Area, six Wildland Areas, one Provincial Park, one seasonal bird sanctuary and one federal migratory bird sanctuary.

These parks and protected areas serve as scientific benchmarks to evaluate the effectiveness of resource management practices in the region. They are part of the total environment, and are considered in management of the entire area. In the RSDS, it is recognized that activities within the region may potentially affect these protected areas.

## Roles and Responsibilities of Government Agencies in RSDS

Federal, provincial and municipal government agencies worked together to guide development of the RSDS. These agencies are regulators as well as stakeholders, and they share responsibility for several areas, including:

- ☐ ensuring resource development follows specific legislation, policies and guidelines;
- ☐ protecting the environment; and
- ☐ protecting human health.

## **Government of Canada**

In addition to administering federal legislation, the federal government shares responsibility with the provincial government for environmental assessment of projects affecting federal legislation, Aboriginal affairs, endangered species, migratory birds and waterfowl, fisheries and fish habitat, national parks, and pollution monitoring and prevention.

## **Municipal Governments**

The municipal governments are responsible for managing the environmental impacts related to drinking water supply, sewage and stormwater disposal, transportation and urban development.

## **Provincial Government**

The provincial government has a number of provincial agencies with legislated responsibilities in the region. The primary ones are described below.

### **Alberta Environment (AENV)**

Responsible for the protection of the province's air, land and water, as well as for the management and conservation of renewable resources such as forestry, fish and wildlife. Protection of the environment occurs through seven core business strategies under the *Environmental Protection and Enhancement Act* (EPEA): project assessment and evaluation; approvals; monitoring; enforcement; pollution prevention; setting standards, objectives and guidelines; and decommissioning and reclamation.

### **Alberta Health and Wellness (AHW)**

Responsible for developing policies and standards that contribute to improving health for all Albertans. AHW provides direction to Regional Health Authorities who promote and protect the health of the people in the region and work toward preventing disease and injury.

### **Alberta Energy and Utilities Board (EUB)**

Responsible for ensuring that development and transportation of the province's energy resources are in the public interest. The EUB also plays a key part in resource appraisal, application review, monitoring and surveillance. In addition, it rules on new applications for energy and utility activities, and amends existing approvals. The Alberta Cabinet must authorize EUB and Natural Resources Conservation Board approvals, which are in addition to any licenses, permits or approvals required under other Acts, regulations or by-laws.

### **Natural Resources Conservation Board (NRCB)**

Responsible for ensuring that major natural resource development projects (forestry, mining, recreation and tourism industries, water management) proceed in a safe, efficient and environmentally responsible manner.



## Activity Approval

When an activity is proposed, several factors are considered, including how the activity will affect the environment. From beginning to end, all activities must follow specific legislation, policies and guidelines. A list of management tools, including the legislation, policies and guidelines that apply to the region, is provided in the supporting appendices document. An example of the process used to make a decision on a mine development also is included.

## Regional Issues and Themes

Among numerous issues being dealt with in the region, only 72 surfaced as being of sufficient concern to be addressed through the RSDS (Appendix C). This low number is a tribute to Alberta's highly effective environmental and natural resources management system and the high level of co-operation among stakeholders in the region.

Through meetings with industry, First Nations and Aboriginal Communities, special interest groups and various government agencies, the list of 72 issues was refined. The issues were then grouped according to similarities in their information gaps, and a list of 14 themes was developed. The themes were put into the order in which regional stakeholders wanted to see them addressed, and placed in three categories. (See Section 4 for additional information on the 14 themes.)

Two task groups were formed under the Cumulative Environmental Effects Management Partnership (CEEMP), a multi-stakeholder group, to undertake a preliminary analysis of the issues before they were put in order. The specific criteria used for the analysis were:

1. Urgency—based on the combination of timing, risk and uncertainty for each issue.
  - Environmental impact consequence and risk (What is the stakeholder's degree of concern at each level? If no further action is taken, what is the risk?)

### Themes

Category A (Based on information gaps and urgency; some work is underway)

1. Sustainable ecosystems
2. Cumulative impacts on wildlife
3. Soil and plant species diversity
4. Effects of air emissions on human health, wildlife and vegetation
5. Bioaccumulation of heavy metals

Category B (Based on information gaps; work is underway)

6. Access management
7. Cumulative impacts on fish habitat and populations
8. Effects of tailings pond emissions
9. Effects of acid deposition on sensitive receptors
10. Impacts on surface water quality

Category C (Based on information gaps; work is underway; less urgency)

11. End pit lake water quality
12. Impacts on surface water quantity
13. Impacts on groundwater quantity
14. Impacts on groundwater quality

- Timing of impact (When will the stress occur and how long will it last? Is it happening now? Is the effect immediate or does it show up later? Is the effect over a threshold level? Is it reversible?)
  - State of management system (What is being done now to reduce uncertainty? What are the current management initiatives to reduce or control the impact related to the issue?)
2. Gaps—based on identifying the information and systems needed to manage each issue.
- Scientific and traditional information (baseline information on the resource affected. Information on stress factors [stressors] affecting the resource. Information on the processes available for mitigation).
  - Measurable management objective (policy, objectives, approvals).

The issue of health was common to most themes, and the condition of the environment was seen as being important to the health of regional residents. Alberta Health and Wellness will be involved directly or will be consulted on the health-related aspects of each theme area. Several other groups will also assist in addressing RSDS themes, including the CEEMP, the  $\text{NO}_x/\text{SO}_2$  Management Working Group, the Reclamation Advisory Committee, the Wood Buffalo Environmental Association, the Terrestrial Environmental Effects Monitoring Program, the Regional Aquatics Monitoring Program, and the Canadian Oil Sands Network for Research and Development.

## Proposed Timelines, Activities and Resources

### Timelines

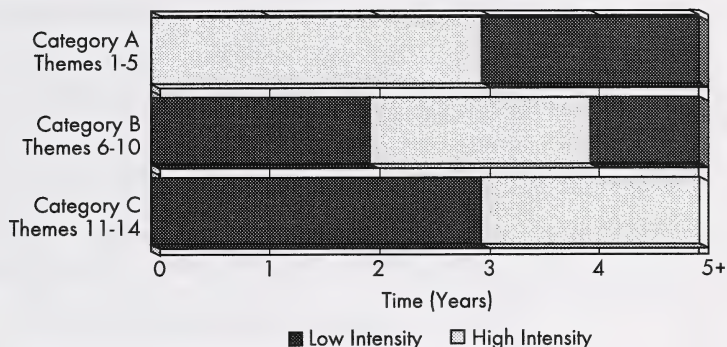
Proposed timelines have been given on the blueprints (Section 4) for addressing individual themes. Work already underway on the themes will continue. Much of the information gathering, research and management evaluation completed over the first two years likely will apply to all themes.

Over the first three-year period, RSDS work will focus on Category A. By the third year, work on B themes will start up and efforts on A themes will be less intense. In the fourth year, intensive efforts will be split between Category B and C themes. By the fifth year, efforts focused on C themes will remain high, while the intensity on B themes will be reduced. At the end of the fifth year, the overall success in resolving the three RSDS theme areas will be evaluated, and a new blueprint for action will be confirmed.

The proposed timelines are shown on the bar graph. They will be adapted as work is reviewed to reflect work in progress. A spreadsheet will be maintained on each issue to track work in progress.



## Proposed Intensity Level for Work on Themes



### Activities

AENV anticipates that planning activities for orderly economic development will be led by the EUB, NRCB, industry and municipal, provincial and federal agencies with related responsibilities. It also is anticipated that activities related to monitoring, planning and delivering public health services will be led by regional and provincial health agencies, with participation by federal health agencies where appropriate.

### Resources

Industry and government currently are funding multi-stakeholder forums, research, monitoring and reporting programs, and management actions in the region. A number of these programs are identified in the technical supporting document.

For the RSDS, urgent and essential ongoing tasks should have earliest access to available funding, scientific and technical support, and stakeholder time. Less urgent tasks will be addressed as resources become available, or their urgency changes.

The Regional Board of Directors (RBD) for AENV's Northeast Boreal Region will rely on departmental resources to deliver the overall co-ordination and leadership role of RSDS. AENV will consult industry, government and public stakeholders on an ongoing basis to identify how resources can best be allocated.

The appropriate amount of funding, expertise and time to effectively deliver research, multi-stakeholder forums and related management activities will be developed as detailed work plans are drafted for the themes.

Research will be focused on urgent issues, while still maintaining essential ongoing research and monitoring. Potential research funding programs will be identified and used, and opportunities for co-operative research will be sought with other research organizations and management programs, including those in other regions.

## Building an Information Base for RSDS

AENV and other regional stakeholders have gathered a substantial amount of information on the existing science and environmental management aspects of the RSDS region (see technical support document). There are 67 programs, projects or committees that conduct research or monitoring, or work on developing guidelines and recommendations for resource management and reclamation. The information on the objectives, participants and progress of each program was collected through a survey of regional stakeholders and additional information gathering (see technical supporting document).

### Regional Information System (RIS)

The primary purpose for the RIS is to provide baseline information, as well as data storage and manipulation, and to assist in the current and future management of the area. If desired, it also can be the primary storage site for all information available on managing the environment, and all renewable and nonrenewable resources in the region.

Development of a regional information system will be shared among resource developers, provincial and federal government agencies, and any other stakeholder with a vested interest in the region. Initially, the existing information and the gaps that need to be filled will be identified by AENV. The system will include mapping, inventories, monitoring and reporting on key indicators of sustainability, and access tools.

A multi-stakeholder working group will be set up in the very near future to design the database and make sure it functions as required. The database will be developed in phases to make sure it meets the requirements of the region. The area covered by the first phase will match the area of surface mineable oil sands. The database will be used to assist in developing regional goals and objectives.

In addition to creating the initial design, the multi-stakeholder working group will handle issues such as providing information to fill gaps, making information available to participants and other users, handling proprietary concerns, and determining how the database will be made available to all stakeholders.

Inventories will be undertaken for activities, land clearing and reclamation, air emissions, water discharges, water use, and renewable and non-renewable resources. Key sustainability indicators will be monitored and reported.

A list of reference materials and the location of databases available to participants will be needed. In some cases, the information may be considered "proprietary" and therefore initially owned by the company that collected it. Where this occurs, the contact company will be listed.

The practice of sharing data is important, since decisions will be made using the available data. The intent of the RSDS is that data will be shared to ensure comprehensive decision-making.



# Section 3

## The RSDS Management Model

**Regional Goals** are the ends to be achieved

**Management Objectives** are the quantitative expression of the goals

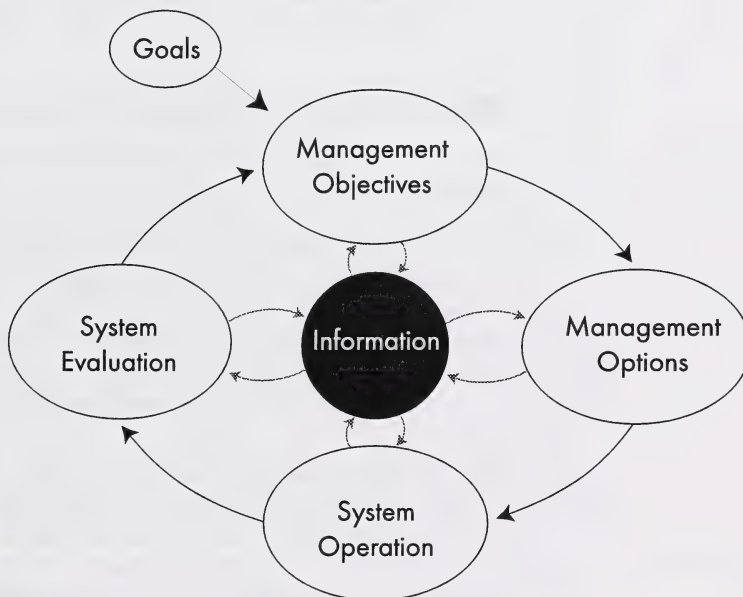
**Management Options** are the means applied to achieve the objectives

**System Evaluation** is the assessment of the success in achieving goals and objectives

**System Operation** is the specific mechanisms and actions needed to apply the management options

**Information** is the knowledge for ongoing support of the management system

The RSDS has adopted the “continuous improvement management model” that is already being used by the Clean Air Strategic Alliance (CASA), the Wood Buffalo Environmental Association, and proposed by CEEMP. It has six elements that operate in a circular pattern. The model allows for new information to be considered and new management approaches to be incorporated in support of better environmental and resource management. The sections following the diagram below outline how the CASA management model will be adapted for use in the RSDS strategy.



This system is based on the CASA SO<sub>2</sub> Management Model. The model starts with defining goals and then moves in a clockwise direction through the management objectives, management options, system operation, system evaluation, and finally returns to objectives. At each step, the available information at the centre is checked to answer the following questions:

- ☐ Setting objectives - are management objectives fulfilling the goals?
- ☐ Selecting management options - are the options suitable for achieving the objectives?
- ☐ Implementing the options - is the system operation suitable for the options?
- ☐ Before evaluating the system - does the system need to be improved to meet the objectives and goals?

## Setting Regional Goals

Within the context of provincial goals already set for Alberta, specific regional goals will be developed where they are lacking. AENV will work with regional stakeholders on this process. At all times, the ultimate objective of integrating resource use and environmental protection to create a balance must be clear. In some cases, an activity may need to be modified so it does not conflict with other activities allowed in the region, or occur outside provincial goals.

The process requires clear communication, working together and making compromises. Stakeholders need to determine if their activities are consistent with the regional and provincial goals. In some cases, it may be necessary for some stakeholders to modify their specific activity to avoid conflict with other activities approved in the region. Government agencies will co-ordinate this joint stewardship approach.

## Setting Management Objectives

In addition to provincial objectives already in place for the region, new objectives will be set for the region as required, or existing objectives will be modified or enhanced. The objectives will be for the overall region, with some set on a site-specific basis, and will be as simple as possible to use. For example, land disturbance guidelines, and air and water quality guidelines, provide objectives that are relatively simple to measure. Where objectives and indicators are complex and difficult to determine or measure, regional stakeholders representing scientific, traditional, industrial, public and regulatory interests will work together to develop a common understanding and agreement.

Most of the objectives will be interrelated, and new objectives will be merged with existing ones. When one objective is set, one or more of the others may have to be adjusted. As new data becomes available, and as the structure of the RSDS matures, the objectives and indicators may need to be modified to incorporate this new information. Part of the strength of the RSDS is that it uses "adaptive management", which allows it to accommodate changes without affecting its basic function.



**Note:** The following table is an **example** of a method to co-ordinate, compare and organize the regional limits and targets. *The numbers are for illustration purposes only.*

Regional Objective (what is desired)	Maintain Wildlife Populations (Theme 2)	Vegetation Fit for Human and Wildlife Consumption (Theme 5)	Water Quality Fit for Municipal Supply, Protection of Aquatic Life, and Recreation (Themes 7 and 10)
Sustainability Indicator (what is measured) (#/twp)	Regional population of wildlife species "X"	Trace Substance "Y" in plants (% of samples above guideline) samples above guidelines)	Water Quality Guidelines for Designated Uses (% of
Regional Sustainable Numerical Objective	16	0	0
Area Under Industrial and Urban Developments	0	N/A	N/A
Reclaimed Areas	5	3.0	0
Future Mine Area	15	0.1	0
Non-Mining Area	18	0.05	0
Harvested Forest Areas, Access Roads, Exploration	3	0.01	0
Current Regional Status*	15	0.22	0
Difference Between Objective and Current Regional Status	Populations of species "X" below regional objective.	Does not meet regional objective.	Meets regional objective.
Proposed Action(s)	Modify regional Wildlife Management Unit regulations to enhance population recovery in reclaimed areas.	Additional reclamation research needed to ensure that plants do not accumulate trace substances. Emission control may be required to limit substance emission and deposition distant from industrial processing site.	Continue aquatic monitoring.

\* Determining the current regional status is possible only if research, monitoring and reporting are a priority.

## Choosing Management Options

The management options chosen to address environmental issues will depend on how the existing or proposed activity causing the issue is affecting the resource and the overall environment. By using a **tiered management approach**, the RSDS management model can deal with many activity levels. The tiered management diagram shows how this approach can be used to select management options to make sure sustainable development is achieved.

The **critical level** is the continuous maximum amount of stress that an ecosystem can support (e.g., deposition of a pollutant or removal of a species) without resulting in long-term environmental damage. The **target level** is the management objective for the amount of stress on an ecosystem. It usually is less than the critical level to provide a margin of safety. The **cautionary level** shows that additional or more intensive monitoring is required to ensure the amount of stress on an ecosystem does not exceed the target level.

If an issue arises that is a priority, but it is not covered by a management objective and there is not enough information on how much stress the environment can sustain, the system places the amount of stress between the cautionary level and the target level. The sustainable level would be established only after further monitoring, research and stakeholder consultation. In the interim, precautionary levels may be established.

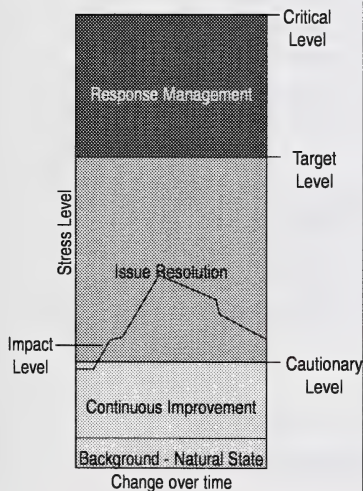
If an issue is raised in which the amount of stress has gone beyond the target level, or the target level is unknown, the system triggers stakeholder consultation for a limited period of time. A strategy to reduce the amount of stress will be developed.



## Tiered Management Approach

As the amount of stress reaches each tier, the suggested management options are initiated within the appropriate timelines.

Example: Impact of Management System at Different Activity Levels



Management Tier

### Critical Load

#### Response Management

- ☐ Stakeholder-derived response strategy
- ☐ Mandated implementation of response strategy by regulators through the approvals process.
- ☐ Best available technology in new, expanding and retrofitted facilities.
- ☐ Economic instruments; activity restrictions.

Management Tier

### Target Level

#### Issue Resolution Management

- ☐ Expanded environmental monitoring and applied research initiated to support issue resolution.
- ☐ Stakeholder consultation—issue resolution strategy.
- ☐ Voluntary implementation of issue resolution strategy by regulators and affected stakeholders.
- ☐ Best available demonstrated technology abatement equipment in new, expanding and retrofitted facilities.

Management Tier

### Cautionary Level

#### Continuous Improvement

- ☐ Best management practices.
- ☐ Adherence to provincial and national guidelines for leak detection and repair.
- ☐ Routine environmental and activity monitoring.

## Gathering and Using Information

Responsible environmental management relies on the most up-to-date data, such as scientific information, resource inventory, impact assessment and traditional resource use (see technical support document). Research and monitoring provide a clearer understanding of how resource development affects the environment. They are used to help set guidelines for commercial activities, as well as to measure how well industry follows the regulatory requirements. The computer models used to predict the impact on the environment rely on monitoring to determine how accurate their predictions are, and on research to improve their accuracy and precision.

## Operating the System—Blueprints for Action

Blueprints to begin addressing environmental issue themes identified during development of the RSDS are shown in Section 4. These were based on preliminary screening of the issues, and will be used in undertaking work described in the themes. Each theme's activity, schedule and co-ordinating group is shown across from the relevant area of the management model. An inventory of the issues in each theme and the associated management groups, monitoring and research programs that apply to individual issues, are contained in the technical support document.

Work will begin immediately, or continue where programs are currently in place, on the issues in Category A. In order to make progress in resolving these issues, all available relevant information for each theme will undergo a more detailed analysis. The results will be used in establishing specific regional goals and objectives where they are lacking, and—eventually—to prepare issue resolution and response plans.

## Evaluating the System—Assessing the Success of RSDS

Progress reports and workshops will be used to track progress and report on each theme. This will also assist in evaluating how well the RSDS is performing. Communications plans will be prepared for conveying information on environmental issues and management to the public. A progress report will be prepared on the RSDS at regular intervals. An RSDS Progress Workshop will then be held following release of the RSDS progress report. The workshop and report will occur annually for the first two years, and on alternate years after that (this timing is subject to review). At the workshop, the Regional Board of Directors (RBD) of AENV or CEEMP representatives and stakeholder groups will review the progress of ongoing issue themes, including actions that are planned, completed or underway.



## Introducing New Issues

CEEMP will provide a point of contact for the issues. Regional stakeholders can contact CEEMP to present new issues, or voice concerns, questions or comments on the progress of regional issues. The AENV-RBD will be responsible for responding to stakeholder concerns and requests. CEEMP first will determine whether a concern presented to them already is addressed through one of the existing themes. If so, the AENV-RBD or CEEMP will respond in writing to the stakeholder on the status of their issue. If the issue is not currently addressed under an existing theme, AENV-RBD or CEEMP will assign it to an existing theme or schedule the issue to be addressed at an annual RSDS progress workshop (or before if the issue is urgent).

The RSDS workshop provides an opportunity for participants to influence the RSDS development and priority setting of issues. The workshop also will provide a place to review resource commitments to produce a realistic action plan and timelines for each theme. Following the workshop, modified action plans will be prepared for the most highly ranked issue themes, and new issues will be included, as required.





# 4.

## Section

# Blueprints for Action

## 1. Theme

### Sustainable Ecosystems and Land-Use

*Category A (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains 11 separate issues. It covers balancing land-uses with the cumulative impact of development on regional ecosystems. Actions under this theme support the goal of ensuring the ecosystem can sustain its current vegetation, fish and wildlife populations under the current and projected levels of industrial, traditional and recreational activity.

#### Blueprint for Action

Management Objectives	<b>Proposed Activity</b> Interim terrestrial objectives for: <ul style="list-style-type: none"> <li>• Habitat requirements</li> <li>• Biodiversity</li> <li>• Traditional use</li> <li>• Reclamation performance</li> <li>• Recreational capability</li> <li>• Landform and watershed design</li> </ul>	Estimated Time Allotment Two years	Co-ordinating Group(s) AENV-RBD/CEEMP/RAC
Management Options	Management protocols Develop Annual Allowable Cut (AAC) mitigation requirements End land-use planning	Three years	AENV-RBD/EUB/RD
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>• <i>Public Lands Act</i>; Leases</li> <li>• <i>Forests Act</i>; FMA, quota certificate, permits</li> <li>• Reclamation certification</li> <li>• EUB/EPEA approvals</li> <li>• <i>Water Act</i> approvals</li> <li>• Hunting permits</li> <li>• Fishing regulations</li> <li>• Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD/EUB
Information Gathering	Landform topography inventory Research on habitat requirements Continue wildlife species inventory Continue research on resilience/stability of reclaimed land GIS land disturbance scenario modeling	Two years	AENV-RBD/CEEMP
System Evaluation	Verify objectives Validate management system	Two years	AENV-RBD/CEEMP

## Cumulative Impacts on Wildlife

*Category A (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains six separate issues. Actions under this theme support the goal of conserving the ability of current and reclaimed habitat to sustain wildlife populations under the cumulative impact of development, and during present and future levels of industrial, traditional and recreational activity.

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Interim terrestrial objectives for: <ul style="list-style-type: none"> <li>Wildlife requirements</li> <li>Population levels for key indicator species (Linked to objective on reclamation performance)</li> </ul>	Two years	AENV-RBD/CEEMP
Management Options	Validate habitat suitability index Regional wildlife management planning Regional Access Management Policy Integration with AAC mitigation requirements End land-use planning	Three years	AENV-RBD/CEEMP
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li><i>Public Lands Act</i>; Leases</li> <li><i>Forests Act</i>; FMA, quota certificate, permits</li> <li>Reclamation certification</li> <li>EUB/EPEA approvals</li> <li>Hunting permits</li> <li>Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD/EUB
Information Gathering	Landform topography inventory Research on habitat requirements Wildlife species inventory and key indicator species monitoring Monitor user access and land-use patterns Geographic Information System (GIS) land disturbance scenario modeling	Two years	AENV-RBD/CEEMP
System Evaluation	Verify objectives Validate management system	Two years	AENV-RBD/CEEMP



## Soil and Plant Species Diversity

*Category A (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains six separate issues. Actions under this theme focus on biodiversity and sustainable ecosystems. It covers biodiversity and sustainability on reclaimed lands, soil salvage, soil and vegetation diversity, and end land-use needs and objectives.

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Interim terrestrial objectives for: <ul style="list-style-type: none"> <li>Biodiversity on reclaimed sites</li> <li>Reclamation performance</li> <li>End land uses (including capability for traditional uses)</li> </ul>	Two years	AENV-RBD/RAC
Management Options	Wetland mitigation Validate Land Capability Classification System End land-use planning	Three years	AENV-RBD/RAC
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li><i>Public Lands Act</i>; Leases</li> <li><i>Forests Act</i>; FMA, quota certificate, permits</li> <li>Reclamation certification</li> <li>EUB/EPEA approvals</li> <li>Audit/enforcement/abatement</li> <li>Biodiversity management policy</li> </ul>	Ongoing	AENV-RBD/EUB
Information Gathering	Benchmark sites Baseline species inventory Soil materials type and depth research Reclamation performance monitoring Wetland water level monitoring Validation of hydrological drawdown models Start research into developing "Best Practices for Biodiversity Establishment" Validate soil capability system	Two years	AENV-RBD/TERRE
System Evaluation	Verify objectives Validate management system	Two years	AENV-RBD/CEEMP

## Effects of all Air Emissions on Human Health, Wildlife and Vegetation

*Category A (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains nine separate issues. Actions under this theme support the goal of protecting human health, wildlife and vegetation from the cumulative impact on air quality from all regional air emissions (alone or in combination).

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Interim air quality objectives for key Volatile organic compound (VOC)/Polycyclic aromatic hydrocarbon (PAH) compounds of concern (e.g., Benzene, Toluene, Ethylbenzene, Xylene [BTEX]) Review regional emission targets	Two years	AENV-RBD/AHW/CEEMP
Management Options	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>Economic instruments</li> <li>Air quality notification levels</li> <li>Source apportionment for regional particulate matter</li> </ul>	Three years	AENV-RBD/EUB
System Operation	EUB/EPEA approvals Audit/enforcement/abatement	Ongoing	AENV-RBD/EUB
Information Gathering	Continue long-term human exposure monitoring Continue long-term receptor based monitoring Information on VOC sources (biogenic and anthropogenic) Research on ozone (effects and regional production) Research on air pollution interactions and regional effects GIS-based regional inventory of industrial air emissions	Two years	AENV-RBD/AHW/WBEA
System Evaluation	Verify objectives Validate management system	Two years	AENV-RBD/CEEMP



# Theme

## Effects of Heavy Metals Deposition – Consumption and Bio-Accumulation

*Category A (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains three separate issues. Actions under this theme support the goal of protecting human health, wildlife, fish and vegetation (especially the quality and abundance of traditional vegetation used by First Nations and Aboriginal Communities in the region) from the deposition and increased loading of heavy metals (HM).

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Interim HM deposition objectives Review regional emission targets	Two years	AENV-RBD/AHW/CEEMP
Management Options	Review policies and guidelines to address traditional use needs Air quality notification levels Source apportionment for regional particulate matter	Three years	AENV-RBD/EUB
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>EUB/EPEA approvals</li> <li>Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD/EUB
Information Gathering	Long-term exposure monitoring Long-term receptor based monitoring Research on heavy metals accumulation in plants Regional inventory of vegetation species (traditional use plants)	Two years	AENV-RBD/AHW/WBEA (TEEM)
System Evaluation	Verify objectives Validate management system	Two years	AENV-RBD/CEEMP

## Access Management

*Category B (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains two separate issues. Actions under this theme support the goal of conserving wildlife (especially the quality and abundance of traditional wildlife used by First Nations and Aboriginal Communities in the region). Increased access also affects the ability of First Nations and Aboriginal Communities to carry out cultural and spiritual activities with minimal disturbance.

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Review guidelines for access (linked to objective for cumulative impacts on wildlife)	Three years	AENV-RBD/CEEMP
Management Options	Review Access Management Policy to address traditional use needs Evaluate Forest Land-Use Zones Review regional wildlife management	Four years	AENV-RBD/CEEMP
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>Hunting permits</li> <li>Fishing regulations</li> <li>Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD
Information Gathering	Monitor user access and land-use patterns Wildlife species inventory and key indicator species monitoring GIS land disturbance scenario modeling Review methods to manage access	Four years	AENV-RBD/CEEMP
System Evaluation	Verify objectives Validate management system	Two years	AENV-RBD/CEEMP



# Theme

## Cumulative Impacts on Fish Habitat and Populations

*Category A (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains five separate issues. Actions under this theme support the goal of ensuring the ability of current and reclaimed habitat to sustain fish populations under the cumulative impact of development, and during present and future levels of industrial, traditional and recreational activity.

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Interim objectives for: <ul style="list-style-type: none"> <li>Instream flow needs</li> <li>No net loss of fish habitat (Linked to objective for key indicator species) (Linked to objective for reclamation performance)</li> </ul>	Three years	AENV-RBD/CEEMP
Management Options	Review Access Management Policy Evaluate Forest Land-Use Zone Review regional fisheries management	Four years	AENV-RBD
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>Detailed Forest Management Planning (DFMP); Quota Certificate, Permits</li> <li>Reclamation certificate</li> <li>Department of Fisheries and Oceans (DFO)/EPEA approvals</li> <li>Fishing regulations</li> <li>Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD
Information Gathering	Continue to monitor fish population status Continue monitor fish harvesting Continue fish quality monitoring (health and tainting) Creel angler surveys Continue flow monitoring on smaller watersheds Research on hydrology of reclaimed lands Research on impact of water flow on fish habitat	Four years	AENV-RBD/RAMP
System Evaluation	Verify objectives Validate management system	Three years	AENV-RBD/CEEMP

## Effects of Emissions From Tailings Ponds

*Category B (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains four separate issues. Actions under this theme support the goal of protecting human health from the cumulative impact of tailings pond emissions containing volatile organic chemicals (VOC) and odorous chemicals, such as reduced sulphur compounds (RSC).

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Finalize air quality objectives for key VOC and PAH compounds of concern (e.g., BTEX)	Three years	AENV-RBD/CEEMP
Management Options	Mine development planning Review best management practices for tailings production, handling and reclamation	Four years	AENV-RBD/EUB
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>EUB/EPEA approvals</li> <li>Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD
Information Gathering	Long-term exposure monitoring Long-term air quality monitoring Research on mechanism for tailings pond emissions Monitoring to quantify pond emissions of VOC and RSC Research on VOC sources (biogenic and anthropogenic)	Four years	AENV-RBD/WBEA/CEEMP
System Evaluation	Verify objectives Validate management system	Three years	AENV-RBD/CEEMP



## Effects of Acid Deposition on Sensitive Receptors

*Category B (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains 10 separate issues. Actions under this theme support the goal of conserving acid-sensitive soils, rivers, lakes, wetlands and associated vegetation complexes under the cumulative impact of deposition and increased loading of acidifying compounds.

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Interim objectives for: <ul style="list-style-type: none"> <li>acid deposition</li> </ul> Review regional emission targets	Three years	AENV-RBD/CEEMP
Management Options	Review policies and guidelines to address inter-provincial issues Economic instruments	Four years	AENV-RBD/EUB
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>EUB/EPEA approvals</li> <li>Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD/EUB
Information Gathering	Continue long-term SO <sub>2</sub> exposure monitoring Continue long-term receptor based monitoring Acid deposition monitoring for wetlands and aquatic ecosystems Regional inventory of vegetation species (traditional use plants) GIS-based regional inventory of acidifying air emissions and receptors Research on effect of acid deposition on regional receptors	Four years	AENV-RBD/AHW/ WBEA (TEEM)/RAMP
System Evaluation	Verify objectives Validate management system	Three years	AENV-RBD/CEEMP

### Cumulative Impacts on Surface Water Quality

*Category B (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains eight separate issues. Actions under this theme support the goal of protecting the water quality and hydrological integrity of regional watersheds (Athabasca, Muskeg River and Kearl Lake) from the cumulative impact of increased development. Surface water quality is a factor in the cumulative effects on the health of wildlife, fish, aquatic biota, vegetation and humans in the region. (See technical support document for regulations, policies and guidelines currently in place.)

#### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Interim water quality objectives for key naphthenic acids of concern	Three years	AENV-RBD/CEEMP
Management Options	Review guidelines for water releases from oil sands mines Management plan for Muskeg River Basin	Four years	AENV-RBD/EUB
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>EUB/EPEA approvals</li> <li>Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD/EUB
Information Gathering	Continue research on Consolidated tailings (CT) release water Continue research on toxicity of naphthenic acid Research on brown water systems (natural toxicity causes) Analysis of impact of muskeg drainage on receiving streams Research on cumulative impacts of multiple developments Research on long-term hydrological and biological integrity of watersheds Review water quality monitoring information	Four years	AENV-RBD/AHW/CEATAG/RAMP
System Evaluation	Verify objectives Validate management system	Three years	AENV-RBD/CEEMP



# 11 Theme

## End Pit Lake Water Quality

*Category C (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains two issues. Actions under this theme support the goal of protecting the water quality and hydrological integrity of regional watershed from the impact of releases from end pit lakes (EPL), and conserving the water quality of EPL.

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Finalize water quality objective for key naphthenic acids of concern Set interim terrestrial objectives <ul style="list-style-type: none"> <li>• acceptable purposes and uses of EPL</li> </ul>	Four years	AENV-RBD/CEEMP
Management Options	Review guidelines for water releases from oil sands mines End Land-Uses for EPL	Five years	AENV-RBD/EUB
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>• <i>Water Act</i>/EPEA approvals</li> <li>• Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD/EUB
Information Gathering	Continue research on CT release water Continue research on salt build-up in CT recycle water Research establishing viable ecosystems in EPL Research on cumulative impacts of multiple developments on long-term hydrological and biological integrity of watersheds Review water quality and aquatic resource monitoring information	Five years	AENV-RBD/AHW/ CEATAG/RAMP
System Evaluation	Verify objectives Validate management system	Four years	AENV-RBD/CEEMP

## Cumulative Impacts on Surface Water Quantity

*Category C (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains three issues. Actions under this theme support the goal of conserving surface water quantity and flow regimes in the Athabasca River and its tributaries (Muskeg River) from the impact of development.

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Interim water quality objective for: <ul style="list-style-type: none"><li>• Instream flow needs for Athabasca River</li><li>• Instream flow needs for tributaries</li></ul>	Four years	AENV-RBD/CEEMP
Management Options	Review guidelines for water releases from oil sands mines End land-uses for end pit lakes (EPL)	Five years	AENV-RBD/EUB
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"><li>• <i>Water Act</i> approvals</li><li>• Audit/enforcement/abatement</li></ul>	Ongoing	AENV-RBD/EUB
Information Gathering	Tributary flow monitoring Improved climate monitoring (evaporation and sunshine data) Modeling EPL and its effect on flow regimes Research on Instream Flow Needs (IFN) and its relationship to habitat suitability Flow monitoring on smaller watersheds Research on hydrology of reclaimed lands	Five years	AENV-RBD/AH/W RAMP
System Evaluation	Verify objectives Validate management system	Four years	AENV-RBD/CEEMP

# 13. Theme

## Cumulative Impacts on Groundwater Quantity

Category A (Specific work plans will be developed with stakeholders, including the specific task teams.)

This theme contains two issues. Actions under this theme support the goal of conserving groundwater quantity.

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Review existing objectives	Four years	AENV-RBD/CEEMP
Management Options	Review best management practices	Five years	AENV-RBD
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>• Water Act approvals</li> <li>• Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD
Information Gathering	Study aquifer yield Pumping tests with observation well Study area/extent of aquifer cone of depression Computer modeling of aquifer response (pumping and recovery period)	Five years	AENV-RBD/CEEMP
System Evaluation	Verify objectives Validate management system	Four years	AENV-RBD/CEEMP



## Cumulative Impacts on Groundwater Quality

*Category C (Specific work plans will be developed with stakeholders, including the specific task teams.)*

This theme contains two issues. Actions under this theme support the goal of protecting groundwater quality from the impact of seepage from existing tailings ponds, reclaimed landforms and deep-well disposal. Groundwater quality affects surface water quality.

### Blueprint for Action

	Proposed Activity	Estimated Time Allotment	Co-ordinating Group(s)
Management Objectives	Interim objectives <ul style="list-style-type: none"> <li>Acceptable deep-well disposal of waste</li> </ul> Finalize objectives <ul style="list-style-type: none"> <li>Acceptable groundwater quality and uses in reclaimed landscape</li> </ul>	Four years	AENV-RBD/CEEMP
Management Options	Review best management practices (well construction/maintenance)	Five years	AENV-RBD
System Operation	<b>Management Tools:</b> <ul style="list-style-type: none"> <li>Water Act approvals</li> <li>EPEA/EUB approvals</li> <li>Well construction/maintenance auditing</li> <li>Audit/enforcement/abatement</li> </ul>	Ongoing	AENV-RBD
Information Gathering	Update geological database (GIS) Finalize groundwater-monitoring network Water quality monitoring potable aquifers in region Research on quality of water needed to recharge aquifers Research on effects of seepage from tailings ponds and reclaimed structures	Five years	AENV-RBD/CEEMP
System Evaluation	Verify objectives Validate management system	Four years	AENV-RBD/CEEMP

# Appendix

## Deputy Minister Initiating Letter



Office of the  
Deputy Minister

10th floor  
Petroleum Plaza South Tower  
9915 - 108 Street  
Edmonton, Alberta  
Canada T5K 2C9

Telephone 403/427-6236  
Fax 403/422-6305

September 23, 1998

Dear Athabasca Oils Sands Stakeholders:

The Athabasca Oil Sands area has historically, is currently and will in the future, be a focal point for resource and environmental management in Alberta. Given the number of resource development proposals being considered it is important to continue to provide proper context for resource and environmental management.

The Government of Alberta is committed to providing clear direction and effective decision making for sustainable resource and environmental management. Within this context, Alberta Environmental Protection is committing to lead the development of a "Regional Sustainable Development Strategy" for the Athabasca Oil Sands. We are also committed to building a stronger partnership with the public, industry, and all governments involved.

There are five steps required: 1) Describe and improve coordination of current activities; 2) Analyze gaps in science and knowledge; 3) Direct research to fill gaps; 4) Set goals, thresholds and targets; and, 5) Ensure implementation of effective monitoring, communication and decision-making.

The strategy will be used as the context to assess and guide resource and environmental management. Results will be implemented and decisions made in an adaptive management approach, keeping pace with new information and goals. This includes management of facilities after approval.

Terms of Reference will be in place by October 31, 1998. The project will be completed by July 31, 1999.

We will be in touch with your offices to initiate the process. We look forward to your participation and support for this important initiative.

Sincerely,

A handwritten signature in black ink, appearing to read "Jim Michals", written over a circular stamp or seal.

Jim Michals, Deputy Minister

cc: Sustainable Development Coordinating Council  
Athabasca Oil Sands Cumulative Effects Initiative Members

♻️ Printed on recycled paper.





# B.

## Appendix Terms of Reference

### Introduction

Acknowledging that there is significant interest in development of Alberta's Oil Sands, these Terms of Reference have been produced in order to guide creation of a regional strategy for sustainable resource development coupled with strong environmental management and protection. AENV recognizes the importance of the numerous multi-stakeholder activities dealing with a wide variety of sustainable resource, environmental and health issues related to the development of the Athabasca Oil Sands. Keeping these initiatives in context, ensuring common understanding and clear direction for resource and environmental management within a provincial and federal regulatory framework is a goal shared among regional stakeholders.

### Purpose

The purpose for the creation of a Regional Sustainable Development Strategy (RSDS) for the Athabasca Oil Sands is to ensure implementation of adaptive management approaches that address regional cumulative environmental effects, environmental thresholds, appropriate monitoring techniques, resource management approaches, knowledge gaps and research to fill gaps. In order to protect the environment and quality of human health as it relates to the environment, the RSDS will become a management tool that keeps pace with new information, science and technology. The management approach delivered within the RSDS may include a streamlining of current regulatory processes thereby gaining more efficient and timely use of public and private resources.

Founded on AENV's strong partnerships (Appendix A) with stakeholders in the region and sound technical and scientific research, the RSDS will ensure that comprehensive information is available in order to guide decision-makers. AENV is committed to lead the development of a regional strategy that provides clear direction for sustainable resource, environmental and related health management.

Once complete, the RSDS will provide a blueprint for action, which will continue to be tracked and implemented for many years to come.

### Time Frame

The RSDS target date for completion of the Strategy Document is mid-1999. These Terms of Reference identify five components (Appendix B) with target dates and it is expected that the Strategy Document will further identify or clearly establish target dates for specific initiatives in a three-year work plan.

## Principles

The RSDS will ensure collaboration among all regional initiatives thus optimizing efforts and maximizing results (Appendix C). The guiding principles for the strategy include:

- ☐ the regulatory regime (both federal and provincial) is transparent
- ☐ linkages among all initiatives are provided
- ☐ clear responsibility and accountability for the management of environmental effects is delineated
- ☐ decision-making is streamlined
- ☐ new information is incorporated on an ongoing basis
- ☐ developments and facilities are reviewed on a regular basis after approvals are issued

The RSDS will apply provincial and federal policy, legislation, standards and programs in a regional context, including principles in the Canadian Council of Ministers of the Environment (CCME) Harmonization Accord.

AENV is providing leadership and accountability for the RSDS and is committed to seeking and building on its partnerships with stakeholders. AENV will ensure that the public will be involved.

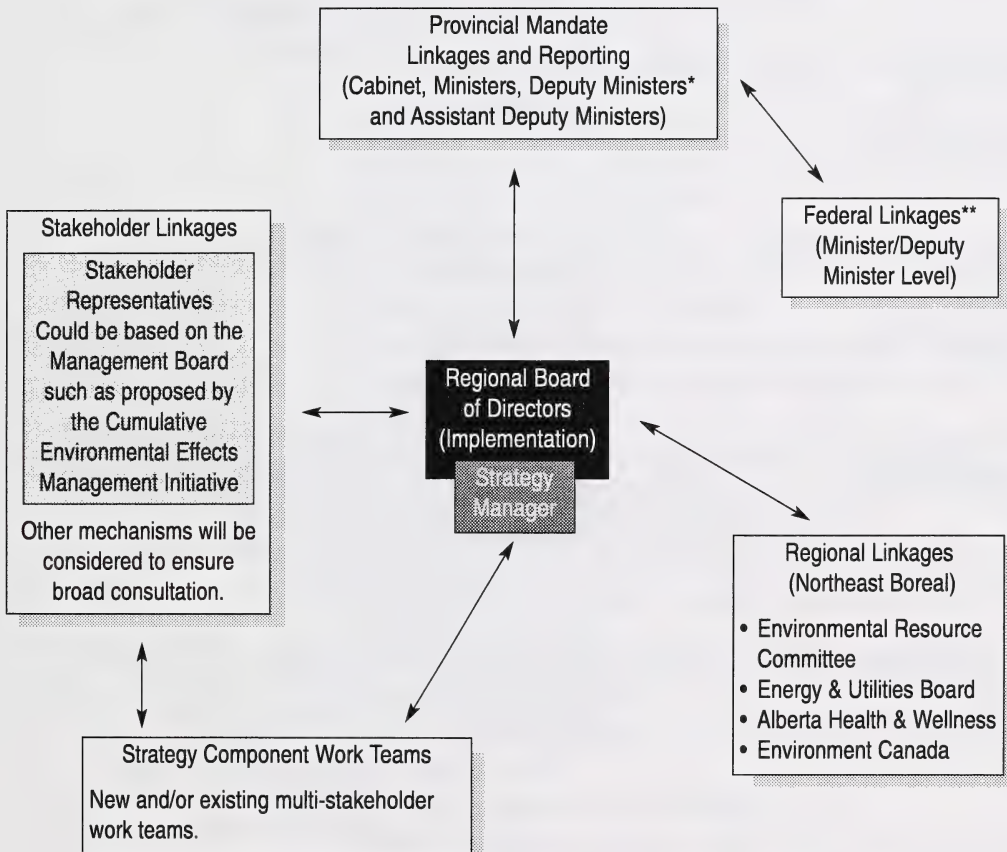
The RSDS is built upon collaboration among regional multi-stakeholder teams, open communication and consultation with all interested parties. Numerous existing committees, working groups and initiatives are already involved in related matters in the Athabasca Oil Sands region and effective integration of these activities into a regional management framework is essential.

## Regional Area Definition

The RSDS land base will encompass activities within the area described in the "Fort McMurray-Athabasca Oil Sands Subregional Integrated Resource Plan", and associated activities on surrounding lands. The definition is flexible to reflect the resources being managed and the effects being considered (e.g., river basins, watersheds, air shed) so that the strategy area is adjusted as necessary.

## Linkage Chart

The chart represents the strategy linkage between stakeholders and the government regulatory regime:



\* Sustainable Development Coordinating Council

\*\* Note: Federal Government representatives are participating in the Stakeholder Groups and Work Teams



## Strategy Elements, Timing, Partners and Products

The chart summarizes the components associated with the strategy, their time frames and those involved and the product envisioned:

Components	Start	Finish	Partners	Product
1. Describe: i) The current resource and environmental management regime; ii) the current initiatives and recommend better coordination.	Sept/98	July/99	AENV, AHW Industry, Federal Government, Municipalities, Aboriginals, Non-Government Organizations (NGOs)	Report on "what is" and recommendations for better coordination.
2. Define where environment and resource science and knowledge needs to be enhanced.	Oct/98	July/99	AENV, AHW, Industry, Federal Government, Municipalities, Aboriginals, NGOs	Research plan of the area
3. Research directed to opportunities under step 2 above.	Early 99	2001 (possibly longer, depends on activity)	AENV, AHW, Industry, Federal Government, Municipalities, Aboriginals, NGOs	Research priorities established, efforts and \$'s redirected. It will take more than 2 years to complete and evaluate much of the research.
4. Examine and enhance management regime* (this includes goals that are based on science and values).	Nov/98	July/99	Provincial, Federal and Municipal agencies, Aboriginals, Industry, NGOs	A strategy to guide decisions and project reviews. Will include goals, thresholds, and targets where appropriate (some of which exist, others will be modified, some will be new).
5. Implementation.	Nov/98	Ongoing	AENV, Industry, Federal Government, Municipalities, Aboriginals, NGOs	Effective monitoring, communication and decision-making: the new Strategy facilitating adaptive management.

- Component #4 will keep pace with new information, including the management of facilities after approval, on a continuous basis. As new science and knowledge are acquired (e.g. under #3), management will be adapted based on good science and public values.

## RSDS Values, Desirables and Deliverables of Strategy and its Components

- ☐ AENV and stakeholders are committed to the enhancement of environmental protection techniques, and using the RSDS as a tool to recommend Policy and Regulatory Framework improvements.
- ☐ RSDS provides a regional focus and context with clear purpose.
- ☐ Ensures that all stakeholders are informed.
- ☐ From the stakeholder representatives, advisory groups may be formed - depending on issue.
- ☐ Environment Canada is identified, along with provincial departments in the regional linkage group. Environment Canada and other federal agencies will assist the regional Board of Directors in development and implementation of the Strategy.
- ☐ Will seek effective, modern and efficient methods which can be proven.
- ☐ Guarantees that the public will be involved.
- ☐ Provides assurance of support for the involvement of various stakeholders.
- ☐ Stakeholders are committed to support the process developed through RSDS.
- ☐ AENV will provide leadership via the NE Boreal Regional Board of Directors consisting of the Regional Directors of Land and Forest Service, Environmental Service and Natural Resource Service.
- ☐ An RSDS manager has been appointed to facilitate strategy development.
- ☐ RSDS will address the issues of cumulative effects, thresholds, monitoring techniques, and research.
- ☐ RSDS will identify knowledge and research gaps and will provide direction to researchers to fill these gaps.
- ☐ Requires adaptive management approaches ensuring up to date (best) practices are in place.
- ☐ Effectively streamlines the current processes.
- ☐ Provides a comprehensive regional strategy framework with guidelines to coordinate and integrate environmental management activities in the region.





# Appendix

## RSDS Partners

- AFRD - Agriculture, Food and Rural Development
- AED - Alberta Economic Development
- AENV - Alberta Environment
- AHW - Alberta Health & Wellness
- ARD - Alberta Resource Development
- CEAA - Canadian Environmental Assessment Agency
- EC - Environment Canada
- ES - Environmental Service, Alberta Environment
- LFS - Land and Forest Service, Alberta Environment
- NRCB - Natural Resources Conservation Board
- NRS - Natural Resources Service, Alberta Environment
- RMWB - Regional Municipality of Wood Buffalo

## Management Team

- |                                      |                                |
|--------------------------------------|--------------------------------|
| Randall Barrett, Lead Management, ES | Lisa Wilde, ES                 |
| Chris Hale, LFS                      | Noel St. Jean, ES              |
| Glen Rowan, NRS                      | Richard Chabaylo, NRS          |
| Bruce Cartwright, LFS                | (Dale Huberdeau), LFS deceased |

## Science Team

- |                              |                 |
|------------------------------|-----------------|
| Ken Foster, Lead Science, ES | Lisa Holmes, ES |
| Monique Richard, ES          | Kem Singh, ES   |
| Larry Rhude, NRS             |                 |

## RSDS Project Team

- |  |                  |
|--|------------------|
| Rick McDonald, Project Manager/Coordinator | Rick George, ES  |
| Maja Laird, Writer                         | Melody Hopkinson |
| Shauna Smith, Administrative Support       | Mike Boyd, ES    |
| Carol Chawrun, Communications—AENV         |                  |

## Regional Board of Directors

- |                   |                  |
|-------------------|------------------|
| Jay Nagendran, ES | Neil Barker, LFS |
| Dennis Giggs, NRS |                  |

## EIA Directors & AENV Others

- |                        |                       |
|------------------------|-----------------------|
| Annette Trimbee, ES    | Dennis Quintilio, LFS |
| Tim Jantzie, ES        | Ken Ambrock, NRS      |
| Ken Crutchfield, NRS   | Patti Humphrey, ES    |
| Ron Bothe              | David Spink, ES       |
| Keith Leggatt, ES      | Rob Powell, NRCB      |
| Ryerson Christie, CEAA |                       |

## Regional Linkages Group

- |  |                      |
|--|----------------------|
| Neil Barker, LFS                                       | Jay Nagendran, ES    |
| Dennis Giggs, NRS                                      | Mike Boyd, ES        |
| Rhonda Wehrhahn, ARD                                   | Ron Ball, AFRD       |
| Gerry Dube, AFRD                                       | Peter Blackall, EC   |
| Roger Creasey, EUB                                     | Paul Short, AED      |
| Alex McKenzie, AHW                                     | Stephen Clarke, RMWB |
| Bill Miller and Graham Mutch, Province of Saskatchewan | Rick Siddle, AED     |

CEEMP/AENV  
Task Group 1

Don Klym, Suncor, Chair  
Peter Hunt, Alberta Energy and Utilities Board  
Bertha Ganter, Ft McKay Industrial Relations Corporation  
Madeline Delisle, Ft McKay Industrial Relations Corporation  
Ken Shipley, Athabasca Tribal Council; Ft McKay Industrial Relations Corporation  
Tanya Harpe, Anzac Metis  
Rick McDonald, Regional Sustainable Development Strategy  
Ken Foster, Science—Alberta Environment  
Rick George, Environmental Service—Alberta Environment  
Randall Barrett, Environmental Service—Alberta Environment  
Grant Lyons, Syncrude

CEEMP/AENV  
Task Group 2

Judy Smith, Shell, Chair  
Marie Cheecham, Fort McMurray First Nation  
Ian MacKenzie, Mobil Oil  
Lynne Kemper, Athabasca Chipewyan First Nation  
Peter Hunt, Alberta Energy and Utilities Board  
Rick McDonald, Regional Sustainable Development Strategy  
Ken Foster, Science—Alberta Environment  
Randall Barrett, Environmental Service—Alberta Environment  
Rick George, Environmental Service—Alberta Environment

Stakeholder  
Advisory Group -  
Preliminary Draft  
Review for  
June 24

Bruce Friesen, Syncrude  
Don Klym, Suncor  
Ian MacKenzie, Mobil Oil  
Tony Punko, Athabasca Chipewyan First Nation  
Peter Blackall, Environment Canada  
Judy Smith, Shell  
Marie Cheecham, Fort McMurray First Nation  
Dan Smith, Oil Sands Environmental Coalition  
Peter Koning, Gulf

Government of  
Alberta

Alberta Environment (Alberta Environmental Protection)

- Environmental Service
- Natural Resources Service
- Land and Forest Service
- Environmental Impact Assessment Directors

Alberta Infrastructure (Alberta Transportation and Utilities)

Alberta Health and Wellness (Alberta Health)

- Northern Lights Regional Health Authority

Alberta Economic Development and Tourism

Alberta Resource Development (Alberta Energy)

Alberta Energy and Utilities Board / Natural Resources Conservation Board

Government of  
Saskatchewan

Saskatchewan Environment and Resource Management

Aboriginal  
Communities

Athabasca Tribal Council

- Fort McKay First Nation, Industrial Relations Corporation
- Athabasca Chipewyan First Nation
- Fort McMurray First Nation
- Chipewyan Prairie Dene First Nation
- Mikisew Cree First Nation

Metis Nation of Alberta

Metis Locals

- Conklin
- Consolidated
- Fort McKay
- Fort Chipewyan
- Fort McMurray
- Janvier
- Anzac
- Lac La Biche

Fort McMurray Treaty Peoples Association

Wood Buffalo Tribal Council

Paul Cree Band



Federal  
Government

Environment Canada  
Natural Resources Canada  
Heritage Canada  
Canadian Environmental Assessment Agency  
Health and Welfare Canada  
Department of Fisheries and Oceans  
Department of Indian and Northern Development

Industry

Alberta Pacific Forest Industries  
Canadian Association of Petroleum Producers  
Corridor Pipeline  
Gulf Canada  
Japan Canada Oil Sands Ltd.  
Koch Industries Canada  
Mobil Oil Canada  
Northlands Forest Products Ltd.  
Northstar Energy  
Pan Canadian Petroleum Ltd.  
Petro Canada Ltd.  
Paramount Resources Ltd. - Small Producers and Explorers  
Shell Canada Ltd.  
Suncor Energy Ltd.  
Syncrude Canada Ltd.

Municipal,  
Educational &  
Non Government  
Working Groups

Regional Municipality of Wood Buffalo

- Regional Infrastructure Working Group
- Northeast Boreal Environmental Resource Committee, AENV
- Fort McMurray Environmental Association
- Northern River Basin Ecological Initiative
- Peace Athabasca Delta Committee
- Kings University College
- University of Alberta
- University of Calgary
- Oil Sands Environmental Coalition/Toxic Watch & Pembina Institute
- Ducks Unlimited
- Fort McMurray Fish and Game Association
- Wood Buffalo Environmental Assessment Association
- Regional Aquatics Monitoring Program
- Terrestrial Environmental Effects Monitoring
- Boreal Caribou Research Program

\* List continues to grow and will be updated annually





# D.

## Appendix

# List of Issues for the Regional Sustainable Development Strategy

Environmental Components	Topic	Issue
1 Air	Traditional Resource Use	Effects of deposition of heavy metals and acidifying compounds on traditional plants used by First Nations and Aboriginal Communities in and around the oil sands developments.
2 Air	Traditional Resource Use	Effect of air pollution on bird flyways.
3 Air	Acid Deposition-Soils	Impacts on productivity and vegetation composition of local and regional acid-sensitive soils.
4 Air	Acid Deposition-Surface Water	Impacts on buffering capacity, biological productivity and species composition of acid-sensitive rivers and lakes.
5 Air	Acid Deposition-Vegetation	Impacts on biological productivity of acid sensitive vegetation and changes in species composition and diversity, including impacts on the success and sensitivity of re-vegetation on reclaimed areas.
6 Air	Acid Deposition-Wetlands	Acidification of wetlands may impact mosses and lichens and cause sphagnum moss invasion in poor fens, resulting in changes to wetland composition/diversity.
7 Air	Air Pollutant Interactions	Cumulative impacts from concentration and deposition of air pollutants on human health, wildlife, and vegetation in the region (individual emissions and their interactions, including synergistic effects of ozone).
8 Air	Air Quality Notification	Establishing community air quality notification levels, incorporating both human health and aesthetic needs.
9 Air	Air Toxics	Cumulative impact of concentration and deposition of air pollutants (Air Toxics, Priority Substances Lists 1 & 2) on human health and wildlife (especially amphibians) due to air emissions.
10 Air	Ambient Air Quality Guidelines	Meeting ambient air quality guidelines for criteria emissions, e.g., SO <sub>2</sub> and NO <sub>x</sub> (recognizing that some guidelines are in the process of being updated and that others may need updating, e.g., SO <sub>2</sub> and NO <sub>x</sub> ).

Environmental Components	Topic	Issue
11 Air	Lack of Ambient Air	Several air emissions lack air quality guidelines (e.g., reduced sulphur, individual Volatile Organic Compounds [VOC], PM <sub>2.5</sub> ).
12 Air	Greenhouse Gas Emissions	Regional plans to address Canada's commitments to reduce net emissions of greenhouse gases, such as carbon dioxide (CO <sub>2</sub> ) emissions that occur from combustion of fossil fuels.
13 Air	Ground Level Ozone	Impact of Ground Level Ozone on human health and vegetation. (Ground level ozone is a secondary pollutant formed from NO <sub>x</sub> and VOC emissions.)
14 Air	Heavy Metals Deposition	Impacts of increasing levels of heavy metal deposition on soil and vegetation, fish, wildlife and/or human health.
15 Air	Inhalable Particulate Matter (PM <sub>10</sub> and PM <sub>2.5</sub> )	Impact of inhalable particulate matter on human health and wildlife.
16 Air	Long-range Transport	Monitoring and assessment of long-range transport of air emissions, including acidifying emissions.
17 Air	Noise	Cumulative impact of noise levels in residential settlements and impact of noise by individual projects.
18 Air	Odours	Cumulative impact of odour levels in residential settlements and odours from individual projects.
19 Air	Oxides of Nitrogen	Cumulative impact of increasing NO <sub>x</sub> emissions. These emissions can contribute to the increase of ambient NO <sub>x</sub> concentrations, formation of ground-level ozone, acidification, vegetation effects and human health effects. High temperature combustion processes produce oxides of nitrogen (NO <sub>x</sub> ) emissions.
20 Air	Sulphur Dioxide (SO <sub>2</sub> )	Impact of increasing SO <sub>2</sub> concentrations on human health, vegetation and wildlife. SO <sub>2</sub> is a compound for which ambient air quality guidelines have been stipulated, and it is also a major contributor to acidic deposition.
21 Air	Tailings Pond Emissions	Emissions of VOC and Total Reduced Sulphur compounds from the tailings pond is a concern to nearby residents. Tailings pond issues revolve around the the uncertainty respecting emissions and mitigation strategies for odours and VOC concentration.
22 Air	Upset Emissions	Cumulative impacts of repetitive short-term acute levels of emissions of odorous (reduced sulphur) compounds and volatile organic compounds on human health.
23 Air	Visibility	Deterioration of atmospheric visibility due to elevated concentrations of dust, smoke and smog.
24 Air	VOC Emissions	Minimizing the loss of solvent diluents with the long-term objective of eliminating the release of untreated froth treatment tailings solvents.

Environmental Components	Topic	Issue
25 Air	VOCs	Impact of VOC concentrations on human health, vegetation and wildlife. VOC is a group of compounds with relatively few ambient air quality guidelines that have been stipulated. VOCs are from industrial and natural sources and are a major contributor to odour and ozone formation. Issues here are odour, health and perception of problem.
26 Fisheries	Impacts of Access on Fishing	Over-fishing pressures from increased access. The potential exists for increased access and increased human populations to impact fish populations.
27 Fisheries	Fish Conservation	Activities in the region will result in changes in flow (volume), which in turn will alter fish habitat.
28 Groundwater	Water Quality	Potential effects of improper deep-well disposal of process wastewater ( <i>in situ</i> ).
29 Groundwater	Water Quantity	Changes in groundwater quantity associated with withdrawal due to water supply ( <i>in situ</i> ).
30 Groundwater	Water Quantity	Changes in groundwater quantity associated with mines (other than Basal Aquifer depressurization).
31 Groundwater	Water Quality	Effects of seepage water from reclaimed landforms and tailings ponds.
32 Groundwater	Water Quality	Effects of produced water on groundwater quality ( <i>in situ</i> ).
33 Human Health	Tailings Pond	Effects of seepage from existing tailings ponds.
34 Surface Water	Consolidated Tailings (CT) Reclamation	The potential toxicity of CT release water and its duration on the landscape.
35 Surface Water	Water Quality	Effects of runoff from coke and sulphur piles on water quality.
36 Surface Water	Surface Water	Changes in flows, sediment concentrations and channel regime in receiving streams in local basins and their impacts on fish habitat.
37 Surface Water	Drainage Regime	Restructuring of drainage regimes may contribute to increased erosion and result in impacts to wetlands and change flow rates in tributaries, increase sediment concentration, and have an impact on fish habitat.
38 Surface Water	End Pit Lake (EPL) Water Quality	Impact of EPL water quality on habitat conditions for biota in the lake itself, and for the river/creek into which it will discharge. Uncertain water quality in the EPL, which is a final landscape feature. This results from the proposal to put tailings in the lake and cap it with water, and the quality of water that will be in these lakes from local runoff.
39 Surface Water	Surface Water	Changes in open water areas, including lakes and streams. This is an overall issue of watershed management and cumulative changes in flow regimes due to development.
40 Surface Water	Water Quality	Use of chemical specific guidelines for toxic elements of water discharges instead of "Toxic Units"; e.g., from end pit lakes.



Environmental Components	Topic	Issue
41 Surface Water	Water Quality	Changes in water quality of streams, rivers and lakes due to an individual project and multiple projects, and monitoring and assessment of effects of water pollutants in the downstream region. (Athabasca and PAD)
42 Surface Water	Water Quality	Changes in Athabasca River water quality and the quality of tributaries.
43 Surface Water	Water Quality	Monitoring and assessment of effects of water pollutants in the downstream region (the effects need to include water quality, sediment quality, benthos and fish).
44 Surface Water	Water Quality	Untreated drinking water aesthetics - smell and taste.
45 Surface Water	Water Quality	Silt and other contaminants increase from logging and development.
46 Surface Water	Water Quality	Effects of industrial effluents on fish health - disease, deformities and fish tainting.
47 Surface Water	Water Quantity	In-stream flow needs in the Athabasca River and developed tributaries.
48 Terrestrial	Wetland Assessment and Impacts	The undetermined impact on wetland vegetation communities due to basal aquifer and surface aquifer drawdown, and the uncertainty of lateral distance of impact. This surface drawdown may cause the wetlands to dry up over a significant area, depending on the volume of water removal required to dry a wetland.
49 Terrestrial	End Land-Use	Continuity of landform, watershed and vegetation communities across oil sands mine closure landscapes is necessary for the development of sustainable landscapes and a diverse ecosystem including a diversity of landforms, indigenous vegetation, near-natural water patterns, and wetlands, and a natural appearance.
50 Terrestrial	End Land-Use	Landscape design to create landforms of mine structures that have a natural appearance is possible only if it is planned into the development from project inception (i.e., part of the approval process.)
51 Terrestrial	End Land-Use	Re-establishing a diverse ecosystem including a diversity of landforms, indigenous vegetation, near-natural water patterns and wetlands in the reclaimed landscape.
52 Terrestrial	End Land-Use	The reclaimed landscape will be used for recreational purposes, with the potential for intensive recreational activities including fishing and hunting pressures because of increased access. The capability to support and/or the land to recover after use from these types of activities has to be incorporated into the closure planning. Public information about the government policy with respect to assurances that the cost of end land-use will not be passed along to the public and information about how industry will finance end land-use over the long-term.

Environmental Components	Topic	Issue
53 Terrestrial	End Land-Use	Rapid establishment of functional riparian areas similar to those present in the pre-development landscape following closure and ensuring that watershed structures do not require periodic long-term maintenance.
54 Terrestrial	End Land-Use	Use of native species and traditional plant species in reclamation in the closure planning design.
55 Terrestrial	Traditional Use Values and Mitigation	Which vegetation species existed in the pre-disturbance landscape and which species will be established in the reclaimed landscapes, and when.
56 Human Health	Traditional Use Values and Mitigation	Impact of development on medicinal plants. Are the plants going to be available within a reasonable distance during development; are the plants, etc., going to be available on the reclaimed landscape; and in both cases, are they going to be safe to consume?
57 Terrestrial	Monitoring of Acidification of Terrestrial and Wetland Ecosystems	The cumulative effects of acid deposition by industry, plant and vehicle emissions on terrestrial and wetland ecosystems are unknown and so must be monitored to understand future impacts. The potential impacts and degradation to vegetation and wildlife could affect the future sustainability of wetland vegetation complexes, associated wildlife species, caribou and other sensitive species in northeastern Alberta.
58 Terrestrial	Biodiversity Assessment	<p>The Canadian Biodiversity Strategy recommends that environmental impact assessments address impacts to biodiversity. There is uncertainty about the acceptable level of detail and scope of assessments, and the expectations for restoration. Impacts to biodiversity include changes in landscape and community levels, changes in species and genetic levels, and impacts to rare species such as rare plants.</p> <p>- Soils, plants and wildlife tend to be treated separately rather than in an integrated fashion, as an ecosystem.</p>
59 Terrestrial	Biodiversity Conservation	Protection of areas in the lease that are not underlain by economic oil sands and are not specifically needed for a mine as biodiversity <i>in situ</i> conservation areas.
60 Terrestrial	Diversity of Soil Types to Promote Potential for Vegetation Diversity	The re-creation of a single type (homogenous) topsoil across the reclaimed landscape may not provide an "equivalent capability" for the return of a diversity of native vegetation communities. Research is required to understand the soils and technology necessary to re-establish a diversity of vegetation types, in a reasonable period of time. The requirement to salvage all the presently existing mineral soils may be necessary to prevent the permanent loss of the capability to re-establish and sustain equivalent vegetation and other biological diversity.

Environmental Components	Topic	Issue
61 Terrestrial	Diversity of Soil Types to Promote Potential for Vegetation Diversity	Reclamation soil depths and types should be based on end land use needs. The soil depth may be adjusted for different vegetation types in different locations so as to maximize the speed and likely success of initial reclamation efforts.
62 Terrestrial	Diversity of Soil Types to Promote Potential for Vegetation Diversity	The productivity of soils used to support commercial forests are based on the use of a soil rating procedure called the, "Land Capability Classification for Forest Ecosystems in the Oil Sands Region (LCCS)". The rating system is new and requires monitoring to determine the factors that influence productivity and the long-term sustainability of the forests established and the establishment and viability of other uses.
63 Terrestrial	Cumulative Impacts on Wildlife - Habitat Changes	<p>The uncertainty about cumulative impact of individual and multiple oil sands developments on wildlife as a result of the habitat loss, and larger scale (regional) fragmentation of the ecosystem, has major implications to regional wildlife populations. This is particularly important for wildlife species of concern in Alberta such as the Red, Blue, and Yellow listed species.</p> <ul style="list-style-type: none"> <li>- Changes in habitat availability, connectivity and diversity</li> <li>- Preservation of habitat for threatened animals</li> <li>- Increased mortality risks due to industrial activity and increased traffic flow</li> </ul>
64 Wildlife	Traditional Use Values and Mitigation	Impact of development on wildlife of high traditional value: moose, rabbits, aquatic furbearers, grouse, waterfowl and squirrels.
65 Terrestrial	End Land-Use	Uncertainty about the type of wildlife that the reclaimed land will sustain, and whether the wildlife (moose, rabbits, aquatic furbearers, grouse, waterfowl and squirrels) that will be sustained is congruent with traditional needs.
66 Wildlife	Traditional Use Values and Mitigation	Concern that increased activity in the region has and will result in increased "unregulated" tourism, which may occur on traditional traplines. What protection do trapline holders have against this?
67 Wildlife	Hunting	Over-hunting pressures from increased access and restrictions on hunting access within the development areas and bag limits within the region. Potential exists for increased access and increased human populations to impact wildlife populations.
68 Surface Water	Sustainability	Impacts of multiple developments on long-term hydrological and biological integrity of watersheds such as Muskeg River and Kearl Lake.
69 Terrestrial	End Land-Use	Mitigation of cumulative environmental effects through regional development planning and integrated mine plans for oil sands developments.
70 Surface Water	Tailings	Reduction and mitigation of surface disturbances of oil sands developments through the examination and use of alternative tailings technologies and management.



Environmental Components	Topic	Issue
71 Terrestrial	Traditional Use Values and Mitigation	Space to carry out cultural/spiritual activities without disturbance.
72 Terrestrial	Forest Values	Cumulative impact of development on annual allowable cut and other forest values.



# E.

## Appendix

### Action Taken on Category A Issues Themes 1 to 5



Continuity of landform, watershed and vegetation communities across oil sands mine closure landscapes is necessary for the development of sustainable landscapes and a diverse ecosystem including a diversity of landforms, indigenous vegetation, near-natural water patterns, and wetlands, and a natural appearance.

**Approvals:**

*Albian Sands Energy Muskeg River, Approval 20809-00-01*

5.2.5: A Mine Reclamation Plan, required by June 30, 2001, that provides techniques, procedures and designs for watercourses and riparian areas to ensure that these features are progressively incorporated into the development, are self-sustaining, and are characteristic of natural drainages.

5.2.17 (a) (iii): A Vegetation Management Plan, required by June 30, 2001, which includes considerations for re-establishing the continuity of vegetation patterns between the reclaimed lands and undisturbed lands within the Muskeg River valley.

*Syncrude Aurora North, Approval 18942-00-00:*

5.1.5: Establish surface drainage for reclaimed landscapes that is integrated with adjacent undisturbed land.

5.1.11: Requiring revegetation of disturbed lands to ecosystems compatible with the surrounding undisturbed lands, including commercially viable forest and wetland ecosystems.

MSL 973220 - Disturbed lands shall be contoured to an acceptable land form and the natural drainage restored.

*Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:*

5.2.5: Submit an updated Mine Reclamation Plan by June 30, 2001.

5.2.23: Provide an updated Athabasca River Valley Reclamation Plan, which includes: forest ecosystems and wetland ecosystems indicative of the Athabasca River valley; re-establishment of continuity of vegetation communities with adjacent undisturbed lands; and re-establishment of equivalent habitat diversity, patch size, arrangement and distribution.

5.2.19: Submit a Vegetation Management Plan by June 30, 2001.

*Alberta Timber Harvest Planning and Ground Rules:*

Section 2.2.4: as applied to Alpac and Northlands harvesting approvals, cutblock boundaries should follow natural terrain features and timber type boundaries to minimize the impact of logging.

**Management and Science Initiatives:**

RAC will make recommendations after review of reclamation plans for these continuity issues between mines. RAC also co-ordinates other reclamation related multi-stakeholder initiatives.

The OSVRC reports to RAC and has prepared guidelines for establishing forest ecosystems on reclaimed land.

The WWGC reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land.

TERRE is conducting research on reclamation techniques.

Various industry-led initiatives are co-ordinating and monitoring reclamation activities.

Landscape design to create landforms of mine structures that have a natural appearance is possible only if it is planned into the development from project inception (i.e., part of the approval process.)

**Approvals:**

*Albian Sands Energy Muskeg River, Approval 20809-00-01*

5.2.5 (b) (c): A Mine Reclamation Plan, required by June 30, 2001, focused on developing landform structures that are characteristic of undisturbed lands and progressively incorporating them into annual operations. The plan will discuss techniques and procedures for reclaiming the Muskeg River valley to a final topography characteristic of the pre-disturbance valley.

*Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:*

5.2.11: Provide an update to the Detailed Conservation Reclamation Plan for Suncor's Integrated Mine Plan - Lease 86/17, Steepbank Mine and Athabasca River Valley, July 30, 1996 by January 31, 2000.

Re-establishing a diverse ecosystem including a diversity of landforms, indigenous vegetation, natural water patterns, and wetlands, in the reclaimed landscape.

This is to include an updated Athabasca River Valley Reclamation Plan, which includes: final contours for all topography within the valley characteristic of the pre-disturbed valley; landform structures progressively incorporated into operations and characteristic of natural features; and reclaimed lands to distribution of landscape positions characteristic of pre-disturbance conditions.

5.2.25: Submit a Visual Enhancement Plan for the East Bank Mine Site by September 31, 1999. This should include a detailed design for any processing facilities and structures that must be located within the Clearwater RMA, excluding the existing industrial development area, that demonstrates landscaping of facilities to blend into the surrounding landscape.

#### **Management and Science Initiatives:**

RAC may make recommendations regarding reclamation.

#### **Approvals:**

*Albian Sands Energy Muskeg River, Approval 20809-00-01*

5.2.17 (a) (iii): A Vegetation Management Plan, required by June 30, 2001, which includes considerations for re-establishing the capability for biodiversity in the long-term.

Syncrude Aurora North, Approval 18942-00-00:

5.1.5: Establish surface drainage for reclaimed landscapes that is integrated with adjacent undisturbed land.

5.1.11: Requiring revegetation of disturbed lands to ecosystems compatible with the surrounding undisturbed lands, including commercially viable forest and wetland ecosystems.

*Suncor Millennium (July 16 99 Draft), Approval 94-01-21:*

5.2.11, 5.2.23: Provide an update to the Detailed Conservation Reclamation Plan for Suncor's Integrated Mine Plan Lease 86/17, Steepbank Mine and Athabasca River Valley, July 30 1996 by January 31, 2000. This is to include an updated Athabasca River Valley Reclamation Plan, which includes: self-sustaining watercourses and riparian areas, with characteristic ponds, sloughs, small lakes and charmeled watercourses, inclusion of forest ecosystems and wetland ecosystems indicative of the Athabasca River Valley, re-establishment of continuity of vegetation communities with adjacent undisturbed lands; and re-establishment of equivalent habitat diversity, patch size, arrangement and distribution.

5.2.19: Submit a Vegetation Management Plan by June 30, 2001.

*Alberta Timber Harvest Planning and Ground Rules:*

Section 4.8: Objective: to minimize the impact of timber operations on the visual quality of the forest landscape.

#### **Management and Science Initiatives:**

ELU recommendations have been adopted by AENV.

RAC will make recommendations regarding reclamation and follow up on ELU recommendations.

The OSVRC reports to RAC and has prepared guidelines for establishing forest ecosystems on reclaimed land.

The WWG reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land.

TERRE is conducting research on reclamation techniques.

AENV and WEPA have a project to develop a decision support tool with a focus on habitat fragmentation.

Boreal Caribou Committee manages a science program and provides recommendations on the management regime.

Various industry-led initiatives are monitoring and co-ordinating reclamation activities.

## Issue

The reclaimed landscape will be used for recreational purposes, with the potential for intensive recreational activities including fishing and hunting pressures because of increased access. The land's capability to support and/or recover after use from these types of activities must be incorporated into closure planning. Public information about government policy with respect to assurances that the cost of end land-use will not be passed along to the public and information about how industry will finance end land-use over the long term.

## Work in Progress

## Approvals:

*Suncor Aurora North, Approval 18942-00-00:*

5.5.17: A model of the end pit lake outlining design features and recreational potential will be submitted to the Director by June 30, 2001.

*Suncor Millennium (July 16 99 Draft), Approval 94-01-21:*

5.2.27: submit a Recreation Plan by June 30, 2002. The plan should include, but not be limited to, an assessment of necessary design features that would provide equivalent landscape capabilities for extensive recreational use, and the landscape capability for intensive recreation use around potential recreation attractions.

*Alberta Timber Harvest Planning and Ground Rules:*

Section 4.2: Timber Harvesting will be integrated with other resources according to:

- a) the principle of integrated resource management, recognizing and considering other resource uses and values; and b) Integrated Resource Plans.

Section 4.3.2: Objective: to develop harvest designs and conduct harvest operations in ways that will:

- a) encourage richness of wildlife species by maintaining or enhancing habitat diversity; b) manage for a well distributed habitat capable of providing long-term population viability for all seasonal and year round resident wildlife species; c) ensure that forest management activities maintain the capability for wildlife use of habitat, and d) protect fish habitat.

Section 4.4: Standard 1: Timber operators shall plan and conduct their timber operation in consideration of legislated protected areas and approved recreation resource management plans, where they exist.

**Management and Science Initiatives:**

RAC will make recommendations regarding reclamation issues such as this.

ELU Recommendations (Human Development 3.3).

Rapid establishment of functional riparian areas similar to those present in the pre-development landscape following closure and ensuring that watershed structures do not require periodic long-term maintenance.

## Approvals:

*Albian Sands Energy Muskeg River, Approval 20809-00-01*

5.2.7-5.2.9: A research plan, required by June 30, 2001, for the development of self-sustaining watersheds and functional riparian areas. The plan will include research into channel design parameters and vegetation community establishment.

*Suncor Millennium (July 16 99 Draft), Approval 94-01-21:*

5.2.11.5.2.23: Provide an update to the Detailed Conservation Reclamation Plan for Suncor's Integrated Mine Plan - Lease 86/17, Steepbank Mine and Athabasca River Valley, July 30 1996 by January 31, 2000. This is to include an updated Athabasca River Valley Reclamation Plan, which includes: self-sustaining watercourses and riparian areas, with characteristic ponds, sloughs, small lakes and channeled watercourses, inclusion of forest ecosystems and wetland ecosystems indicative of the Athabasca River Valley; re-establishment of continuity of vegetation communities with adjacent undisturbed lands; and re-establishment of equivalent habitat diversity, patch size, arrangement and distribution.

**Management and Science Initiatives:**

RAC will make recommendations regarding reclamation issues such as this.

The WWG reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land.

TERRE is conducting research on reclamation techniques.

Various industry-led initiatives are monitoring and co-ordinating reclamation activities.



Environmental Component/Topic	Issue	Work in Progress
54 Terrestrial - End Land-Use	Use of native species and traditional plant species in reclamation in the closure planning design.	<p><b>Approvals:</b>  <i>Albian Sands Energy Muskeg River, Approval 20809-00-01</i>            5.2.17 (a), (i): A Vegetation Management Plan, required by June 30, 2001, for incorporating vegetation and vegetation communities of traditional value that are characteristic of those communities on adjacent undisturbed lands.            MSL 973220 - Requires the use of local native plant species for revegetation.  <i>Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:</i>            5.2.19: Submit a Vegetation Management Plan by June 30, 2001.</p> <p><b>Management and Science Initiatives:</b>            RAC will make recommendations regarding reclamation and appropriate end land-use.            The WWG reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land.            The Native Plant Working Group is developing guidelines for the use of native plant materials in Alberta.            The Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region provides a list of vegetation species suitable for use in reclamation.</p>
55 Terrestrial - Traditional Use Values and Mitigation	What vegetation species existed in the pre-disturbance landscape and what species will be established in the reclaimed landscapes, and when.	<p><b>Approvals:</b>  <i>Alberta Timber Harvest Planning and Ground Rules:</i>            Section 5.2.2, Standard 1d: Timber operators are required to provide: a) stand and site assessments provided by the department which will include a basic level of stand assessment and any or all of the following information as required; and b) a description of understory at stand levels of detail.</p> <p><b>Management and Science Initiatives:</b>            Industry EIAs provide baseline data on vegetation communities before disturbance.            RAC will make recommendations regarding reclamation generally and provide co-ordination for management and science initiatives in this area.            The WWG reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land.            The Native Plant Working Group is developing guidelines for the use of native plant materials in Alberta.</p>
56 Human Health - Traditional Use Values and Mitigation	Impact of development on medicinal plants. Are the plants going to be available in reasonable distance during development, are the plants etc. going to be available on the reclaimed landscape and, in either case, are they going to be safe to consume?	<p><b>Management and Science Initiatives:</b>            RAC and CEEWP will review the sequencing and timing for an initiative to develop reclamation guidelines for replacement of traditional land uses (ELU rec. 4.5). Decision expected in 1999.            The WWG reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land.            The TEEM program monitors trace metal content in soil, vegetation and small mammals. A study of metals in traditionally harvested vegetation and wildlife is under development.</p>

Environmental Component/Topic	Issue	Work in Progress
69 Terrestrial - End Land-Use	Mitigation of cumulative environmental effects through regional development planning and integrated mine plans of oil sands developments.	<p><b>Approvals:</b>  <i>Alberta Timber Harvest Planning and Ground Rules:</i>            Section 2.2.6, Guideline 1: harvesting proposals must provide planning for reforestation and harvesting be coordinated to minimize soil erosion, soil compaction and watercourse sedimentation.            EUB approvals address integrated mine development planning.            RSDS provides for adaptive regional development planning using EPEA and other approvals at the time of initial approval or at review intervals.  <b>Management and Science Initiatives:</b>            RAC will provide a forum for co-ordination of reclamation plans to ensure the evolution of ecosystems. (ELU rec. 2.2.1 &amp; 3.1.2).</p>
70 Surface Water - Tailings	Reduction and mitigation of surface disturbances of oil sands developments through the examination and use of alternate tailings technologies and management.	<p><b>Approvals:</b>  <i>Albian Sands Energy Muskeg River Mine, Approval 20809-00-01:</i>            5.2.28: Requirement to submit a Tailings Management Research Program and schedule by June 30, 2001.  <i>Syncrude Aurora North, Approval 18942-00-00:</i>            5.1.14: Tailings research required to determine the considerations that will allow for suitable reclamation of tailings storage areas to forest or wetland ecosystems, or combinations of such. Research will be included within annual reports.  <b>Management and Science Initiatives:</b>            RAC will make recommendations regarding reclamation and appropriate end land-use.            TERRE is conducting research on reclamation techniques.            Industry is conducting research on improved technologies to deal with tailings and their emissions.</p>
72 Terrestrial - Forest Values	Cumulative impact of development on annual allowable cut and other forest values.	<p><b>Approvals:</b>  <i>Albian Sands Energy Muskeg River Mine, Approval 20809-00-01:</i>            3.7.11: The approval holder shall salvage topsoil to reclaim disturbed land to achieve, at a minimum, the site index productivity for re-established commercial forests.            5.2.19-5.2.20: Requirement for a Forest Resource Plan, by January 31, 2001, that includes strategies to minimize and mitigate impacts to the annual allowable cut in the area by the development.  <i>Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:</i>            5.2.29: Submit a Forest Resource Plan by January 31, 2001.  <b>Management and Science Initiatives:</b>            AENV, forest industry and regional stakeholders will work to determine and understand the impact and loss of productive forest lands. (ELU rec. 4.3). AIPac Detailed Forest Management Planning Task Force will prepare the updated DFMP, including mine development and other factors affecting the forest. (Due in 2001 )            RAC will make recommendations regarding reclamation and appropriate end land-use.</p>

2	Air - Traditional Resource Use	Effect of air pollution on bird flyways.
63	Terrestrial - Cumulative Impacts on Wildlife - Habitat Changes	<p>The uncertainty about cumulative impact of individual and multiple oil sands developments on wildlife as a result of habitat loss, and larger scale (regional) fragmentation of the ecosystem, has major implications to regional wildlife populations. This is particularly important for wildlife species of concern in Alberta such as the Red, Blue, and Yellow listed species.</p> <ul style="list-style-type: none"> <li>- Changes in habitat availability, connectivity and diversity</li> <li>- Preservation of habitat for threatened animals</li> <li>- Increased mortality risks due to industrial activity and increased traffic flow</li> </ul>

#### Approvals:

**Albian Sands Energy Muskeg River Mine, Approval 20809-00-01:**  
5.2.23-5.2.24: Requirement to provide a Wildlife Plan by June 30, 2001, which includes techniques and procedures for a) returning disturbed lands to pre-disturbance wildlife habitat capability, and b) re-establishing a diversity of wildlife habitats characteristic of pre-development landscape.

5.2.38 (a),(b): Requirement to participate in a regional wildlife assessment program to include a) validation of wildlife suitability index models used to assess impacts, and b) long-term monitoring of selected special status species, and species of concern, to quantify cumulative impacts on wildlife populations in the region.

**Syncrude Aurora North, Approval 1894200-00:**

5.1.13: Requires the establishment of a diversity of wildlife habitats consistent with undisturbed surrounding land and that which existed in pre-disturbance.

5.1.19-5.11.20: Requires demonstration, through monitoring of wildlife use of reclaimed lands, progress in achieving the wildlife habitat objectives, and reported within the annual plan.

**Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:**

5.2.23: Provide an updated Athabasca River Valley Reclamation Plan, which includes re-establishment of equivalent habitat diversity, patch size, arrangement and distribution.

5.2.33-5.2.34: Submit a Wildlife Plan by June 30, 2001.

5.2.37: Submit a Regional Wildlife Assessment Update by September 1, 2000.

#### Management and Science Initiatives:

AENV with AIPac and WEPA have a Total Effects project to develop a decision support tool for use in addressing habitat fragmentation. (Three year project, complete in 2002.)

AENV and industry are working together to address potential improvements to the biodiversity assessment process, such as determining appropriate methods and baseline surveys.

The provincial government monitors populations of selected species of concern, such as game species, waterfowl, turkeys and Red, Blue and Yellow listed species.

In summer 1999, AENV and EC collaborated on collecting baseline biodiversity data for birds, amphibians and vegetation in the Oil Sands area.

The AFBMP is currently under development and will provide a standardized provincial biodiversity monitoring program for forested areas.

The Boreal Caribou Committee develops and manages a science program and provides recommendations on the management regime which are being used to condition all industrial activities in key caribou habitat.



Environmental Component/Topic	Issue	Work in Progress
64 Wildlife - Traditional Use Values and Mitigation	Impact of development on wildlife of high traditional value; moose, rabbits, aquatic furbearers, grouse, waterfowl, and squirrels.	<p><b>Management and Science Initiatives:</b> AENV with AIPac and WEPA have a Total Effects project to develop a decision support tool for use in addressing habitat fragmentation. (Three year project, complete in 2002.) The provincial government monitors populations of selected species of concern, such as game species, waterfowl, furbearers and Red, Blue and Yellow listed species.</p> <p><b>Approvals:</b> <i>Albian Sands Energy Muskeg River Mine, Approval 20809-00-01:</i> 5.2.23-5.2.24: Requirement to provide a Wildlife Plan by June 30, 2001, which includes techniques and procedures for a) returning disturbed lands to pre-disturbance wildlife habitat capability, and b) re-establishing a diversity of wildlife habitats characteristic of pre-development landscape. <i>Syncrude Aurora North, Approval 18942-00-00:</i> 5.1.12: Restoration of Moose habitat levels equivalent to pre-disturbance conditions. 5.1.13: Requires the establishment of a diversity of wildlife habitats consistent with undisturbed surrounding land and that which existed in pre-disturbance. <i>Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:</i> 5.2.33-5.2.34: Submit a Wildlife Plan by June 30, 2001. 5.2.37: Submit a Regional Wildlife Assessment Update by September 1, 2000.</p> <p><b>Management and Science Initiatives:</b> RAC will make recommendations regarding reclamation and appropriate end land-use. RAC is also the forum for stakeholder review of reclamation plans to ensure relevant wildlife habitat and population objectives for black bear, deer, moose, bird game and furbearers is incorporated into all reclamation plans (ELU rec.3.1.2). AENV with AIPac and WEPA have a Total Effects project to develop a decision support tool for use in addressing habitat fragmentation. (Three year project, complete in 2002.) The provincial government monitors populations of selected species of concern, such as game species, waterfowl, furbearers and Red, Blue and Yellow listed species. TERRE is conducting research on reclamation techniques.</p>
65 Terrestrial - End Land-Use	Uncertainty about the type of wildlife that the reclaimed land will sustain and if the wildlife (moose, rabbits, aquatic furbearers, grouse, waterfowl, and squirrels) that will be sustained is congruent with traditional needs.	
66 Wildlife - Traditional Use Values and Mitigation	Concern that increased activity in the region has and will result in increased 'unregulated' tourism which might occur on traditional trap lines. What protection do the holders of these trap lines have regarding tourism development on their lines?	<p><b>Management and Science Initiatives:</b> The provincial government monitors furbearer populations.</p>
67 Wildlife - Hunting	Over-hunting pressures from increased access and restrictions of hunting access within the development areas and bag limits within the region. The potential for increased access and increased human populations to impact wildlife populations.	<p><b>Approvals:</b> There was a recommendation to put WMU 530 as draw only for the next hunting season, restricting the number of moose hunters in the area. This will require additional public consultation before the recommendation is approved.</p> <p><b>Management and Science Initiatives:</b> The provincial government monitors populations of selected species of concern, such as game species and waterfowl.</p>

Terrestrial - Wetland Assessment and Impacts

The undetermined impact on wetland vegetation communities due to basal aquifer and surface aquifer drawdown and the uncertainty of lateral distance of impact. This surface drawdown may cause the drying of wetlands over a significant area, depending on the volume of water removal required to dry a wetland.

#### Approvals:

*Albian Sands Energy Muskeg River, Approval 20809-00-01:*

5.2.42: Wetland Monitoring Program to determine the potential effects of dewatering and mine development on wetland communities, required September 1, 1999.

*Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:*

5.2.53-5.2.54: Submit a Wetlands Monitoring Program by September 1, 1999 and implement program.

#### Management and Science Initiatives:

The provincial Groundwater Observation Well Network and individual industry programs monitors groundwater levels around mine sites.

Terrestrial - Biodiversity Assessment

The Canadian Biodiversity Strategy recommends addressing the impacts to biodiversity for environmental impact assessments. There is uncertainty as to the acceptable level of detail and scope of assessments and expectations for restoration. Impacts to biodiversity include changes in landscape and community levels, changes in species and genetic levels, and impacts to rare species like rare plants.

- Soils, plants and wildlife tend to be treated separately rather than in an integrated fashion, as an ecosystem.

#### Approvals:

*Albian Sands Energy Muskeg River, Approval 20809-00-01*

5.2.39-5.2.41: A Biodiversity Program, required by June 30, 2001. The program will include a determination of best practices for development of biodiversity on a range of ecosystems; a plan to monitor the return of biodiversity on reclaimed lands; a rare plant survey; proposals for the protection of rare plants around the mine perimeter; comprehensive plant lists for each terrestrial and wetland community type.

5.2.44: Requirement to participate in regional industry initiatives for establishing benchmark sites in adjacent areas to evaluate and monitor changes in biodiversity on reclaimed oil sands leases.

*Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:*

5.2.49-5.2.51: Submit and implement a Biodiversity Program by June 30, 2001.

#### Alberta Timber Harvest Planning and Ground Rules:

Section 4.3.2, Guideline 1 & 2: Forest Harvesting must ensure a minimum of 10 per cent of the gross productive forest land base of each FMU should be managed as mature/overmature forest that is representative of stand types in the area. The types left should be a variety of sizes starting at four hectares or larger.

#### Management and Science Initiatives:

AENV and industry are working together to address potential improvements to the biodiversity assessment process, such as determining appropriate methods and baseline surveys.

The AFBMP is currently under development and will provide a standardized provincial biodiversity monitoring program for forested areas.

In summer 1999, AENV and EC collaborated on collecting baseline biodiversity data for birds, amphibians and vegetation in the Oil Sands area.

The SFMN is a network of programs conducting research on sustainable forestry practices.

RAC will make recommendations regarding reclamation and appropriate end land-use.

Terrestrial - Biodiversity Conservation

Protection of areas in the lease that are not underlain by economic oil sands and are not specifically needed for mine as biodiversity *in situ* conservation areas.

#### Approvals:

*Albian Sands Energy Muskeg River, Approval 20809-00-01*

3.7.5: Requirement to maintain a buffer along both sides of the Muskeg River.

#### Alberta Timber Harvest Planning and Ground Rules:

Section 4.3.5, Guideline 3: Applied to authorizations to harvest trees, small timber stands surrounded on at least three sides by meadows or shrub lands should be maintained in a state of mature forest cover.

Terrestrial - Diversity of Soil Types to Promote Potential for Vegetation Diversity

## Issue

The re-creation of a single type (homogenous) topsoil across the reclaimed landscape may not provide an "equivalent capability" for the return of a diversity of native vegetation communities. Research is required to understand the soils and technology necessary to re-establish a diversity of vegetation types, in a reasonable period of time. The requirement to salvage all the presently existing mineral soils may be necessary to prevent the permanent loss of the capability to re-establish and sustain equivalent vegetation and other biological diversity.

## Work in Progress

### Approvals:

*Albian Sands Energy Muskeg River Mine, Approval 20809-00-01:*

3.7.10-3.7.11: Requirement to salvage topsoil to reclaim disturbed land to achieve equivalent to pre-disturbance for land capability classes and forest site productivity indexes.

3.7.12: Requirement to selectively salvage and store classes 1, 2 and 3 mineral topsoils from the upland portions of the Muskeg River valley.

5.2.10: Requirement to return disturbed land to the minimum post-disturbance area of 4,450 hectares for land capability classes 1, 2 and 3.

5.2.48 (b) (c): Require a coversoil salvage plan with maps showing characteristics, depths, and distribution of coversoil to be salvaged and stockpiled; require a summary of placement depths of coversoils and land capability class for each reclaimed area.

*Synchrude Aurora North, Approval 18942-00-00:*

5.1.11: Requiring re-vegetation of disturbed lands to ecosystems compatible with the surrounding undisturbed lands, including commercially viable forest and wetland ecosystems.

*Suncor Millennium (July 16 '99 Draft) Approval 94-01-21:*

5.2.11: Provide an update to the Detailed Conservation Reclamation Plan for Suncor's Integrated Mine Plan - Lease 86/17, Sleepbank Mine and Athabasca River Valley, July 30 1996 by January 31, 2000. This is to include an updated Athabasca River Valley Reclamation Plan, which includes: management of topsoils materials (Class 1 and 2) to the re-establishment of a variety of ecosystems on the reclaimed landscape; and a minimum of 20 per cent of the disturbed land within the Athabasca River valley shall be reclaimed with soils.

### Management and Science Initiatives:

RAC will make recommendations regarding reclamation and appropriate end land-use.

The Soils Working Group reports to RAC and has developed a land classification system to evaluate land capability for forest ecosystems.

The OSVRC reports to RAC and has prepared guidelines for establishing forest ecosystems on reclaimed land.

The WWG reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land.

TERRE is conducting research on reclamation techniques.

Terrestrial - Diversity of Soil Types to Promote Potential for Vegetation Diversity

Reclamation soil depths and types should be based on end land-use needs. The soil depth may be adjusted for different vegetation types in different locations so as to maximize the speed and likely success of initial reclamation efforts.

### Approvals:

*Albian Sands Energy Muskeg River Mine, Approval 20809-00-01:*

5.2.11: Requirement to replace coversoil to a minimum depth of 0.1 m with an average depth of at least 0.2 m on all disturbed land reclaimed as capability class 2, 3 and 4.

5.2.48 (c): Require a summary of placement depths of coversoil, types of materials used and land capability class of each reclaimed area on a year to year cumulative basis.

### Management and Science Initiatives:

RAC will make recommendations regarding reclamation and appropriate end land-use.

The Soils Working Group reports to RAC and has developed a land classification system to evaluate land capability for forest ecosystems.

The OSVRC reports to RAC and has prepared guidelines for establishing forest ecosystems on reclaimed land.

The WWG reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land.

TERRE is conducting research on reclamation techniques.

Various industry-led initiatives are monitoring and co-ordinating reclamation activities.



Terrestrial - Diversity of Soil  
Types to Promote Potential  
for Vegetation Diversity

## Issue

The productivity of soils used to support commercial forest are based on the use of a soil rating procedure called the "Land Capability Classification for Forest Ecosystems in the Oil Sands Region (LCCS)". The rating system is new and requires monitoring to determine the factors that influence productivity and the long-term sustainability of the forests established and the establishment and viability of other uses.

## Work in Progress

### Approvals:

*Albian Sands Energy Muskeg River Mine, Approval 20809-00-01: 5.2.35-5.2.36*. Requirement for a Land Capability Classification System (LCCS) research program by June 30, 2001. The program will include a) participation in research and monitoring programs to determine soil and landscape factors required to establish equivalent capabilities of site index productivity for the range of ecotypes used in reclamation, and b) validation of whether the LCCS provides the capability for the development and sustainability of a wide range of native ecotype phases.

*Suncor Millennium (July 16 99 Draft), Approval 94-01-21: 5.2.45-5.2.46*. Submit a Land Classification System Research Plan by June 30, 2001.

### Management and Science Initiatives:

RAC will make recommendations regarding reclamation and appropriate end land-use.

The Soils Working Group reports to RAC and has developed a land classification system to evaluate land capability for forest ecosystems. It will be calibrated to show what level of productivity can be achieved from various soils.

The OSVRC reports to RAC and has prepared guidelines for establishing forest ecosystems on reclaimed land.

The WWG reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land.

TERRE is conducting research on reclamation techniques.

Various industry-led initiatives are monitoring and co-ordinating reclamation activities.

7 Air - Air Pollutant Interaction

Cumulative impacts of concentration and deposition of air pollutants on human health, wildlife, and vegetation in the region (individual emissions and their interactions, including synergistic effects of ozone).

**Approvals:**

*Albian Sands Energy Muskeg River, Approval 20809-00-01:*

4.1.13: Environmental effects monitoring (Biomonitoring) report required.

4.1.34: Participation is required in multi-stakeholder forums that include the collection of long-term air quality and human exposure monitoring data to improve future health impact assessments and further the understanding of the links between air quality and human health.

*Syncrude Aurora North, Approval 18942-00-00:*

4.1.8: Participation is required in the Southern Wood Buffalo Zone air monitoring environmental effects monitoring (biomonitoring) programs.

*Suncor Steepbank Approval 94-01-00:*

4.4.1: Report on result of all ambient air quality environmental effects monitoring (biomonitoring) performed between 1996 and 2000 (inclusive) is required prior to March 15, 2001.

4.4.11: A report summarizing performance in achieving expected air emission improvements stated in the Steepbank Mine Project Application is required prior to March 15, 2001. An assessment of the status of SO<sub>2</sub>, NO<sub>x</sub>, VOC and particulate emissions must be included.

*Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:*

4.1.32: Participate in WBEA ambient air monitoring network and operate one continuous ambient air quality monitoring station.

4.1.33: Environmental effects monitoring (Biomonitoring) report required.

4.1.37: Participate in RAMP.

**Management and Science Initiatives:**

The NSMWG is working to design and establish a management system for regional NO<sub>x</sub> and SO<sub>2</sub> emissions by January 31, 2001.

WBEA continuously monitors ambient air quality.

The TEEM program conducts long-term monitoring of forest health, chemistry and metal content of soil, streams, vegetation, traditional resources and small mammals. The emphasis is on detecting impacts of air emissions on the ecosystem.

The OMWG is using modeling and research to fill gaps in knowledge about the regional ozone situation.

The AOSCEHAP program is studying the links between human health and exposure to air pollutants in the Fort McMurray community. A similar program is under consideration for Fort McKay.

8

Air - Air Quality Notification

Establishing community air quality notification levels, incorporating both human health and aesthetic needs.

**Approvals:**

*Albian Sands Energy Muskeg River, Approval 20809-00-01:*

4.1.20 (p): An annual air emissions summary and evaluation report is required by March 15 of each year, for the previous year's data, which includes a description of consultation with the community of Fort McKay to establish, monitor and report community based air quality notification levels.

**Management and Science Initiatives:**

The community of Fort McKay is involved in consultations with Shell and Suncor to address their concerns about air quality.

WBEA continuously monitors ambient air quality.

9 Air - Air Toxics

Cumulative impact of concentration and deposition of air pollutants (Air Toxics, Priority Substances List 1/2) on human health and wildlife (especially amphibians) due to air emissions.

10 Air - Ambient Air Quality Guidelines

Meeting ambient air quality guidelines for criteria emissions, e.g. SO<sub>2</sub> and NO<sub>x</sub> (recognizing that some guidelines are in the process of being updated and that others may need updating, e.g. SO<sub>2</sub> and NO<sub>x</sub>).

### Management and Science Initiatives:

WBEA continuously monitors ambient air quality.

The AOSCEHEAP program is studying the links between human health and exposure to air pollutants in the Fort McMurray community. A similar program is under consideration for Fort McKay.

### Approvals:

*Albian Sands Energy Muskeg River, Approval 20809-00-01:*

4.1.10, 4.1.11: Continuous emission monitoring required annually.

4.1.21-4.1.24: Mine mobile and equipment emission study and minimization plan required six months prior to start-up of the extraction portion of the plant.

4.1.20: Air emission summary and evaluation report required annually on March 15 until 2003.

*Syncrude Aurora North, Approval 18942-00-00:*

4.1.6: Continuous Emissions monitoring report required annually.

4.1.7: Required to operate and maintain an ambient air quality monitoring program through participation in the Southern Wood Buffalo Zone ambient air monitoring network and operate and maintain one continuous ambient air quality monitoring station.

4.1.12: Annual air emissions summary and evaluation report required.

4.1.13: Must submit a summary report on the results of all ambient air quality environmental effects monitoring (biomonitoring) performed between the years 1998 and 2002 (inclusive) prior to March 15, 2003.

4.1.14: Must submit a summary of performance in minimizing atmospheric emissions between the years of 1998 and 2002 (inclusive), that identifies and evaluates all options for further reduction of air contaminant emissions and that demonstrates Syncrude's meaningful efforts to achieve emissions reductions, prior to March 15, 2003.

*Suncor Sleepbank Approval 94-01-00:*

4.4.2: In the event that the emission rate of SO<sub>2</sub> to the atmosphere from all plant sources, excluding the newly quantified emission sources defined in the approval, is higher than an average of 51 tonnes per day during any calendar year, the approval holder shall submit a detailed written report on or before January 31 of the following year.

*Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:*

4.1.30-4.1.31: Continuous emission monitoring report required annually.

4.1.32: Participate in WBEA ambient air monitoring network and operate one continuous ambient air quality monitoring station.

4.1.45-4.1.46: Compile a monthly and annual air emission summary report.

4.1.48-4.1.49: Submit a plan for a program to study and minimize all emissions, where practicable, from mine mobile equipment, by June 30, 2000.

4.1.58: Must submit a summary report on the results of all ambient air quality environmental effects monitoring (biomonitoring) performed between the years 1996 and 2000 (inclusive) prior to March 15, 2001.

4.1.59: In the event that the emission rate of SO<sub>2</sub> to the atmosphere from all plant sources, excluding the newly quantified emission sources defined in the approval, is higher than an average of 66 tonnes per day during any calendar year, the approval holder shall submit a detailed written report on or before March 31 of the following year.

4.1.60: Submit a written report within seven days of any readings of SO<sub>2</sub> or H<sub>2</sub>S greater than the Alberta Ambient Air Quality Guidelines occurring at a continuous ambient air monitoring station operated by the WBEA.



Environmental Component/Topic	Issue	Work in Progress
11 Air - Lack of Ambient Air Quality Guidelines	Several air emissions lack air quality guidelines (e.g., reduced sulphur, individual VOCs, PM <sub>2.5</sub> ).	<p><b>Management and Science Initiatives:</b></p> <p>The NSMWG is working to design and establish a management system for regional NO<sub>x</sub> and SO<sub>2</sub> emissions by January 31, 2001.</p> <p>WBEA continuously monitors ambient air quality, including NO<sub>x</sub> and SO<sub>2</sub>.</p>
13 Air - Ground Level Ozone	Impact of Ground Level Ozone on human health and vegetation. (Ground level ozone is a secondary pollutant formed from NO <sub>x</sub> and VOC emissions).	<p><b>Approvals:</b></p> <p><i>Albian Sands Energy Muskeg River, Approval 20809-00-01:</i></p> <p>4.1.21-4.1.24: Mine mobile and equipment emission study and minimization plan required six months prior to start-up of the extraction portion of the plant.</p> <p>4.1.31-4.1.33: Oxide and nitrogen plant emission report due June 1, 2005.</p> <p>4.1.25: Participation in the WBEA Ozone Modeling Working Group is required until its conclusion.</p> <p><i>Syncrude Aurora North, Approval 18942-00-00:</i></p> <p>4.1.12: Annual air emissions summary and evaluation report required.</p> <p><i>Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:</i></p> <p>4.1.52: Participate in the WBEA Ozone Modeling Working Group until its conclusion.</p> <p><b>Management and Science Initiatives:</b></p> <p>The OMMWG is using modeling and research to fill gaps in knowledge about the regional ozone situation.</p> <p>The NSMWG is working to design and establish a management system for regional NO<sub>x</sub> and SO<sub>2</sub> emissions by January 31, 2001.</p> <p>WBEA continuously monitors ambient air quality, including ozone levels.</p> <p>The AOSCEHEAP program is studying the links between human health and exposure to air pollutants in the Fort McMurray community. A similar program is under consideration for Fort McKay.</p>
15 Air - Inhalable Particulate Matter	Impact of inhalable particulate matter on human health and wildlife.	<p><b>Management and Science Initiatives:</b></p> <p>WBEA continuously monitors ambient air quality, including particulate matter.</p> <p>The AOSCEHEAP program is studying the links between human health and exposure to air pollutants in the Fort McMurray community. A similar program is under consideration for Fort McKay.</p>
18 Air - Odours	Cumulative impact of odour levels in residential settlements and odours from individual projects.	<p><b>Approvals:</b></p> <p><i>Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:</i></p> <p>4.1.43: Conduct sampling and analysis of potentially odorous liquid streams.</p> <p><b>Management and Science Initiatives:</b></p> <p>WBEA continuously monitors ambient air quality.</p>

## Issue

Deterioration of atmospheric visibility due to elevated concentrations of dust, smoke and smog.

Impact of Volatile Organic Compounds (VOC) concentrations on human health, vegetation and wildlife. VOC is a group of compounds with relatively few ambient air quality guidelines that have been stipulated. VOCs are from industrial and natural sources and are a major contributor to odour and ozone formation. Issues here are odour, health and perception of problem.

## Work in Progress

### Management and Science Initiatives:

WBEA continuously monitors ambient air quality, including particulate matter.

### Approvals:

*Albian Sands Energy Muskeg River, Approval 2009-00-01:*

4.1.17-4.1.18: Fugitive VOC emissions and leak detection and repair program report required prior to start-up of the extraction portion of plant.

4.1.26-4.1.30: VOC and TRS compound quantification and characterization plan required six months prior to start-up of the extraction portion of the plant.

*Synchrude Aurora North, Approval 18942-00-00:*

4.1.12: Annual air emissions summary and evaluation report required.

*Suncor Millennium (July 16 '99 Draft), Approval 94-01-21:*

4.1.41-4.1.42: Fugitive VOC emissions and leak detection and repair program report required prior to start-up of the extraction portion of plant.

4.1.53-4.1.55: Submit a plan to quantify and characterize the emissions of VOCs and TRS compounds from fugitive and point sources, by June 30, 2000.

### Management and Science Initiatives:

Industry is conducting research on VOC emissions from tailings ponds.

WBEA continuously monitors ambient air quality.

The AOSCEHEAP program is studying the links between human health and exposure to air pollutants in the Fort McMurray community. A similar program is under consideration for Fort McKay.



## Environmental Component/Topic Theme 5

1 Air - Traditional Resource Use

### Issue

Effects of deposition of heavy metals and acidifying compounds on traditional plants used by First Nations and Metis residents in and around the Oil Sands developments.

### Work in Progress

#### Approvals:

*Albian Sands Energy Muskeg River, Approval 20809-00-01:*

4.1.14: Acid deposition monitoring program for aquatic ecosystems report required 12 months prior to start-up of the extraction plant.

*Suncor Millennium (July '16 '99 Draft), Approval 94-01-21:*

4.1.34-4.1.35: Participation in, report on and commence an acid deposition monitoring program for aquatic ecosystems prior to June 30, 2001.

#### Management and Science Initiatives:

The NSMWG is working to design and establish a management system for regional NO<sub>x</sub> and SO<sub>2</sub> emissions by January 31, 2001.

The TEEM program monitors trace metal content in soil, vegetation and small mammals. A study of metals in traditionally harvested vegetation and wildlife is under development.

The RAMP Acid Sensitive Lake Long-term Monitoring Program will monitor acid sensitive lakes to detect changes caused by acid deposition.

14

Air - Heavy Metal Deposition

Impacts of increasing levels of heavy metal deposition on soil and vegetation, fish, wildlife and/or human health.

#### Management and Science Initiatives:

The TEEM program monitors trace metal content in soil, vegetation and small mammals. A study of metals in traditionally harvested vegetation and wildlife is under development.

56

Human Health - Traditional Use Values and Mitigation  
DUPLICATED IN THEME 1

Impact of development on medicinal plants. Are the plants going to be available in reasonable distance during development, are the plants, etc., going to be available on the reclaimed landscape and, in either case, are they going to be safe to consume?

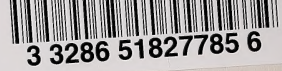
#### Management and Science Initiatives:

RAC and CEEIMP will review the sequencing and timing for an initiative to develop reclamation guidelines for replacement of traditional Land-use (ELU rec. 4.5). Decision expected in 1999.

The WWG reports to RAC and is preparing a framework for the establishment of wetlands on reclaimed land. The TEEM program monitors trace metal content in soil, vegetation and small mammals. A study of metals in traditionally harvested vegetation and wildlife is under development.







3 3286 51827785 6